Deactivation and Decommissioning Focus Area

QUARTERLY REPORT – JANUARY 2000

October – December 1999 Activities

Office of Science & Technology

NETL

D&D Focus Area

On the Cover: clockwise from upper left.

The **Tritium Clean-Up Cart** was demonstrated as part of the Mound Large-Scale Demonstration and Deployment Project.

The **3-D Visual and Gamma Ray Imaging** technology was demonstrated through a Program Opportunity Notice as part of the Canyon disposition Initiative.

The **Vehicle and Cargo Inspection System (VACIS)** was demonstrated as part of the LANL Large-Scale Demonstration and Deployment Project.

The **Pipe Crimping and Cutting System** demonstrated at the Mound Large-Scale Demonstration and Deployment Project..

The purpose of this document is to provide an overview of the Deactivation and Decommissioning D&D Focus Area and to update readers on the program's current activities. It presents a synopsis of the current program status and recent accomplishments, along with overviews of planned activities, program issues, and opportunities. Quarterly reports are distributed to U.S. Department of Energy DOE headquarters and operations office managers, site personnel, site operating contractors, technology developers, principal investigators, regulators, and other stakeholders. Issued in January, April, July, and October, the D&D quarterly reports summarize the activities of each preceding quarter. The D&D Update is published in all other months, introducing new projects and highlighting advances in ongoing projects. Quarterly reports, monthly updates, and further information about the D&D Focus Area DDFA are found on the World Wide Web at *www.netl.doe.gov/dd*. Technologies are usually identified by their discrete tracking numbers within the Technology Management System TMS operated by DOE's Office of Science and Technology OST. Providing access to information about OST programs, technologies, and linkages to EM problems, TMS is found on the World Wide Web at *ost.em.doe.gov/tms/home/entry.asp*.

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1.0 HIGHLIGHTS

German Copper Recycling Technology Demonstrated in the INEEL LSDDP

The Copper Wire Recycle System was shipped from Germany and demonstrated during November 1999. The technology was demonstrated in support of a NETL-sponsored and funded Program Opportunity Notice. Thirteen and a half tons of insulated copper wire, both uncontaminated and surrogate contaminated, was processed to obtain uncontaminated copper for recycling. For this demonstration a surrogate of cobalt, cesium, and fluorescein was applied to the wire to provide post-demonstration evidence of the efficiency of the system to separate and collect contaminated materials and to ensure the copper remained uncontaminated. After pre-sizing and sorting, the contaminated wire was fed into the system where it was granulated. The granulated copper and insulation were mechanically sorted and collected for disposal. The bulk of the contamination was contained in the dust collection system. Any remaining contamination was fixed to the insulation. The copper was recycled and the insulation disposed of as filler in low-level waste disposal packages. The recycling process reduced the waste volume by 80 percent and provided 8 ½ tons of recyclable copper.

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The recycling process reduced the waste volume by 80 percent and provided 8 1/2 tons of recyclable copper.

2.0 Project Summary Table

The following table summarizes the Technical Task Plans for the D&D Focus Area Core Program and related Crosscutting and Industry Program contracts. Project descriptions follow in subsections 2.1 through 2.5 and are organized by the work breakdown structure WBS element listed here.

Project Number	D&D WBS Element	Project Name	Page
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2.1 Demonstration and Industry Approaches

Crates of plutonium-contaminated gloveboxes stored at Los Alamos National Laboratory (LANL) are destined for permanent disposal at the Waste Isolation Pilot Plant (WIPP)

▼LANL TRU Waste Characterization, Decontamination, and Disposition LSDDP

Objective and Scope: The scope of this LSDDP is to demonstrate improved or innovative technologies for the characterization, decontamination, segregation, volume reduction, packaging, and preparation of transuranic (TRU) waste currently in storage at the Los Alamos National Laboratory (LANL) disposal facility at TA-54 and destined for permanent disposal at the Waste Isolation Pilot Plant (WIPP). LANL currently has 1,500 m^3 of TRU waste in inventory—313 plutonium-contaminated gloveboxes in a 24,000 ft^2 facility—and expects to generate another 2,500 m^3 from ongoing operations in coming years.

The LANL LSDDP selected five technologies for demonstration. These five technologies are the AeroGo air pallets, the SAIC Vehicle and Cargo Inspection System(VACIS) for RTR of crates, the Mobile Characterization Services transportable X-Ray for RTR of crates, the Nukem RASP for sectioning gloveboxes, and the Mega-Tech hydraulic cutter.

Status and Accomplishments: The first two demonstrations were executed in June 1999, both providing convincing information on the desirability of the technologies. The AeroGo air pallets proved to be the only viable and accurate method for moving and positioning the crates in the Large Item Neutron Counter (LINC). Additional data will be obtained when the purchased air pallets are used. The VACIS Demonstration was successful in proving that the gamma interrogation techniques could identify the contents of the crates. A total of 43 crates or other truckload scans were taken during the demonstration showing excellent identification of equipment, filters, and dense trash.

The Mega-Tech cutting of glovebox legs using a hydraulic cutter was demonstrated in a simulated radioactive environment at Florida International University's (FIU) facilities.

Current Reporting Period Activities: The demonstration for the Mobile Characterization Services x-ray interrogation of large crates is under subcontract and project plans are complete. The demonstration system was on site on October 4. The demonstration team was on site for one week, but complete approvals were not obtained in time to support a complete demonstration. Currently the demonstration is scheduled for early January 2000.

The Mega-Tech Blade Cutting Plunger is a hydraulic cutter that was evaluated as part of the LANL LSDDP as an option for removal of glovebox legs and appurtenances. The Mega-Tech tool was faster and produced no secondary cutting fines when compared to the baseline, a reciprocating saw. This demonstration was conducted in a simulated radioactive environment at Florida International University. The simulation involved leg removal from a glovebox mockup in a radioactive processing enclosure with technicians in full anti-contamination equipment. Although demonstration of equipment in simulated radioactive environments is not generally in the D&D Focus Area (DDFA) mission, it was judged the optimum way to acquire acceptable data in this application. In the Los Alamos Decontamination and Volume Reduction System process the glovebox processing rate

Mega-Tech Blade Plunging Cutter at LANL LSDDP at the FIU-HCET

requires leg removal equipment on an infrequent, perhaps weekly, basis. In the simulated environment at FIU, multiple technicians were able to demonstrate leg removal equivalent to numerous gloveboxes in two days.

Due to the inadequate fire protection at TA-54, radiological work will be transferred to a permanent structure that is currently being built. In the interim, all demos associated with the LANL LSDDP will be postponed. Once the permanent building is complete demonstrations will resume.

For more information:

http://www-emtd.lanl.gov/LSDDP/DDtech.html

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The Mound Plant in Miamisburg, Ohio commenced operation in 1948.

Mound Tritium D&D LSDDP

Objective and Scope: The Mound Plant in Miamisburg, Ohio began operations in 1948. The site's mission, originally to fabricate the neutron initiator for the atomic bomb, expanded to include research, development, and production of numerous nuclear and nonnuclear weapons components, production of radioisotopically fueled thermoelectric generators, and surveillance of nuclear weapons components.

The objective of the Mound Tritium D&D LSDDP is to identify, demonstrate, and evaluate innovative technologies applicable to the decontamination and decommissioning (D&D) of tritium facilities. D&D of Mound's surplus tritium facilities, the T and R/SW Buildings, provides a unique opportunity to compare, evaluate, and eventually execute innovative D&D technologies alongside baseline technologies in an ongoing project. The Mound LSDDP will identify and explore methods to improve worker safety while achieving cost and schedule savings. The project is expected to identify technologies that, when implemented in the Mound LSDDP, will produce significant savings on the $57.8 million baseline.

The Technical (T) Building is an underground, reinforced-concrete structure built in 1948 for the purification of polonium-210 used in nuclear weapons initiators. Later the facility was used to extract other radionuclides, house the plutonium verification facility, and store TRU materials. Facilities large enough to handle multikilogram quantities of tritium were added to the building. Current plans are to decontaminate T Building which may potentially allow unrestricted public reuse by the year 2003. The SW Complex and one corridor of rooms in the adjacent R Building form the SW/R Complex. Four types of operations have been performed in these facilities to support nuclear weapons programs using tritium: component development, component evaluation operations, tritium recovery, and material analysis. To meet DOE's vision of completing the environmental restoration of the site by 2005, the SW/R Tritium Facilities will be demolished, and contamination beneath the building will be removed.

It is anticipated that innovative technologies will be applied to the following decontamination tasks:

1. tritium-contaminated gloveboxes
2. tritium characterization techniques
3. productivity improvement technologies
4. tritium specialties decontamination
5. piping system removal and disposition
6. mixed waste treatment and disposal

7. tritiated water treatment
8. contaminated water plume under SW building
9. miscellaneous rad/non-rad traditional building materials disposition

The Mound LSDDP IC Team includes Babcock & Wilcox of Ohio, Lawrence Livermore Laboratory (LLNL), British Nuclear Fuels Limited (BNFL), Foster Wheeler, IT Corp, LANL, Westinghouse Savannah River, Princeton Plasma Physics Laboratory (PPPL) and Florida International University.

Status and Accomplishments:
Completed Demonstrations:

1. ***Portable Scintillation Counter (OST/TMS ID 2311)***: The Lumi-Scint portable scintillation counter is a portable, single-tube liquid scintillation counter that can be set to respond to the low-energy beta radiation from tritium. It uses a single photomultiplier tube and manual sample chamber. The Lumi-Scint can be run from an internal battery or 110 vAC for its operation. The unit can be obtained with a printer, which allow hard copies of its electronically stored data.

2. ***Water Solidification (OST/TMS ID 2312)***: This technology uses polymer-based absorbent (Waterworks SP-400) that can be used to solidify aqueous waste. It is similar to other polymer-based absorbents that offer benefits over traditional solidification agents such as cement or the Mound facility baseline solidification agent Aquaset. Benefits include a high liquid to absorbent ratio; no mechanical mixing is required to promote the absorption process; there is little to no volume increase in the waste form after addition of the absorbent; and a very high retention in the form of the gel-like material.

Demonstrated at Mound to solidify tritiated pump oils, NOCHAR Petrobond® is a high-quality polimer Specifically designed as a petrolem based liquid absorbent.

3. ***Oil Solidification (OST/TMS ID 2313)***: This contaminated oil solidification technology—NOCHAR Petrobond®—is a high-quality polymer offered by NOCHAR®, Inc., of Indianapolis, Indiana, and is specifically designed as a petroleum-based liquid absorbent. The Petrobond® absorbs very quickly with little increase in volume. The Petrobond® can be used for free-liquid control in storage, transport, and disposal of low-level radioactive waste.

Current Reporting Period Activities:
In the first quarter of FY 2000, the Mound Tritium D&D LSDDP demonstrated two technologies. The first of the two demonstrations was LLNL's Tritium Clean-up Cart. The Tritium Clean-up Cart, which has been deployed at LLNL since the early 1990's, currently functions as a portable tritium scrubber module easily moved from one decontamination task to the next. The Clean-up Cart module can be used as a stand-alone cart for scrubbing the tritium effluent from large tanks, gloveboxes, and manifolds, which are at or near atmospheric pressure. The next generation LLNL clean-up cart design has been optimized for use in larger, more complex D&D tasks such as those which currently exist at the Mound site.

Design features of the Tritium Clean-up Cart include the following: a scrubbing process that is based on catalytic oxidation of tritium with the resultant HTO collected on mole sieve dryers, a projected decontamination factor greater than 1000, process flow rate of at least 45 liters/minute, reactor/dryer efficiency monitored by process plumbing tritium Femto-Tech monitors, mole sieve dryer beds configured in series with moisture monitors to prevent moisture breakthrough, preheater/reactor redundant temperature/over temperature controllers, system gas flow via Senior Flexonics MB601 pump, process flow control via Brooks flow controllers in the main plumbing loop and air inlet system, process thermocouples that provide process stream and enclosure over-temperature control, dryer beds configured for easy removal/disposal, and an enclosure that can function as a ventilated hood during normal operating conditions, but can be isolated when tritium concentrations inside the enclosure exceed the pre-selected control setpoint.

The demonstration of the Tritium Clean-up Cart was conducted during November at the Mound site. Preliminary results of the demonstration indicate the Tritium Clean-up Cart

performing very well and levels of tritium coming down as expected in the glovebox.

The second demonstration during this quarter was a small, hand-held, battery-operated crimping tool manufactured by Burndy Products. This tool utilizes a separate hydraulic pump with a high-pressure hose connected from the pump to the crimping head. U-shaped dies are contained in the head for crimping. A battery-powered hydraulic pump or electric-powered pump can be used to develop 10,000 psi of pressure to the crimping head. A total of 30 crimping operations can be performed before recharging is needed. The small dimension and light weight make this tool very suitable for crimping in tight quarters. The demonstration was conducted on tubing under negative pressure to avoid any tritium release to workers. Preliminary results indicate the demonstration to be highly effective in improving removal efficiency of the piping and improving the safety at the same time. This technology is likely to be immediately deployed at Mound.

For more information:

http://www.doe-md.gov/lsdd/lsdd.htm

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▼321-M Fuel Fabrication Facility Deactivation LSDDP

Objective and Scope: The deactivati on of Savannah River Site's 321-M Fuel Fabrication Facility is the first LSDDP the DDFA is sponsoring with the Office of Nuclear Material and Facility Stabilization. This 60,000-ft^2 facility currently has small quantities of highly enriched uranium reactor fuel material that requires special control and accountability. Once the

material is removed and the deactivation is complete, the facility will be much less expensive to maintain. Five innovative and improved technologies will be demonstrated in key areas, including characterization, decontamination, dismantlement, and waste management. The potential cost savings and mortgage reductions are estimated to be $20 million.

The IC Team (ICT) for this project includes representatives from Florida International University, the U.S. Army Corps of Engineers, Duke Engineering and Services, Westinghouse Savannah River Company, and Bechtel National-Oak Ridge.

Status and Accomplishments: The following technologies have been demonstrated as part of the SRS 321-M Fuel Fabrication Facility Deactivation LSDDP.

1. Long-Range Alpha Detection for Component Monitoring (OST/TMS ID 2382)
2. X-Ray K-Edge Heavy Metal Detection System (OST/TMS ID 134)
3. ALARA 1146 Strippable Coating (OST/TMS ID 2314)
4. Size Reduction Machine (OST/TMS ID 2395)
5. Electret Ion Chambers (OST/TMS ID 2315)

Current Reporting Period Activities: The Savannah River Site completed its final technology demonstration. All the ITSRs and Demonstration Fact Sheets have been completed. The Final Report has been turned in, and is currently being reviewed. The SRS LSDDP website has been turned over to the D&D Focus Area for permanent archiving.

For more information:

OST/TMS ID 2200

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INEEL Fuel Storage Canals and Associated Facilities LSDDP

Objective and Scope: The Idaho National Engineering and Environmental Laboratory (INEEL) Fuel Storage Canals and Associated Facilities LSDDP is led by an IC Team consisting of Parsons Engineering, British Nuclear Fuels Limited, Lockheed Martin Idaho Technologies Company, TLG Engineering, Florida International University, and Idaho State University. This LSDDP will utilize funding, technologies, and expertise from the Offices of Environmental Restoration, Science and Technology, and Nuclear Material and Facility Stabilization; industries; universities; and the international community.

The project includes the following areas:

- *Test Reactor Area TRA-660*, housing two underwater research reactors, the Advanced Reactor Measurement Facility and the Coupled Fast Reactivity Measure-ment Facility, with a 30,000-gal interconnecting water canal that was sometimes used for fuel storage. These facilities were utilized for reactivity insertion experiments that were later scaled up for experiment design in larger reactors. The two reactors achieved criticality in 1960 and 1962, respectively. Neither has operated since February 1991. Contamination includes radioactive elements, lead, and chromium.
- *TRA Filter Pit system*, consisting of five structures containing large filters associated with test reactor operations. The facilities are contaminated with lead, radioisotopes, and deteriorating asbestos. The filters are located in restricted entry pits, and work will have to be done remotely and in confined spaces.
- *TAN-620 Initial Engine Test Control Room*, a massive underground, shielded, heavily reinforced concrete structure that served as the control center for the engine tests in the Aircraft Nuclear Propulsion Program conducted at INEEL in the late 1950s and 1960s. Contamination includes asbestos, mercury, lead, and some potential radiation.

This LSDDP is a high priority for the DOE/Commercial Nuclear Utilities D&D Consortium, with demonstrated technologies having deployment opportunities in the nuclear utility market through the consortium. Resulting deployments throughout the DOE complex alone could generate a potential cost savings and mortgage reduction of $20 million.

Eleven to 18 innovative and improved technologies will be demonstrated in the areas of underwater inspection, characterization, and dismantlement; inspection, characterization, and dismantlement in restricted spaces; recycle of materials from D&D activities; removal of loose radiological contamination on walls, floors, piping, and equipment; removal of fixed radiological contamination on concrete; tank, vessel, and piping decontamination; lead plate radiological decontamination; and high-radiation exposure fields.

Current Reporting Period Activities: At the close of FY 1999, the IC Team had selected a total of 21 technologies for demonstration from 135 technologies screened. These are a remote submersible vehicle for reactor pool inspections (RUCS, OST/TMS ID 2151), soft-sided containers for disposal of low-level D&D waste (OST/TMS ID 2240), an automatic locking scaffolding system (OST/TMS ID 2320), a lead paint analyzer (OST/TMS ID 2317), a Robotic Climber with a scabbler (En-Vac), an Alloy

Analyzer, a PCB Analyzer, an Electromagnetic Radiography (EMR) instrument, a Portable Safety Monitor (PSM), an In Situ Object Counting System for "free release" of decontaminated areas (IFR), a Copper Wire Recycle System, Paint Scaler, Global Positioning Radiometric Scanner (GPRS), Electro-Chemical Decontamination System named CYGNUS, 3-Dimensional Surface Mapping System called 3D UKRobotics, Roughing Filter Technology by Advanced Nuclear Pre-Filter (ANAP) and Integrated Vertical and Overhead Decontamination System (IVODS). Three technologies that were once approved for demonstration were cancelled due to schedule or budgetary constraints and one technology that was approved for demonstration was combined with an already approved technology (En-Vac Corner Scabbler with En-Vac Wall Scabbler) for a current total of 17 technologies that are planned to be demonstrated or have been demonstrated during the INEEL LSDDP.

Of these, eight have been demonstrated (FY 1998-1999) and nine are planned to be demonstrated in FY 2000. Two of the planned nine technologies were demonstrated during this period and an additional technology began its demonstration during the period.

The PCB Analyzer demonstration was started on June 2, 1999, with the collection of samples for both the baseline and new technologies, and was competed November 18, 1999. This screening tool allows D&D operations to make immediate determinations for dispositioning rooms and facilities, rather than wait the typical 30-90 days for conventional laboratory results.

The Copper Wire Recycle System was shipped from Germany and demonstrated during November 1999. The technology was demonstrated in support of a NETL-sponsored and funded Program Opportunity Notice. Thirteen and a half tons of insulated copper wire, both uncontaminated and surrogate contaminated, were processed to obtain uncontaminated copper for recycling. For this demonstration a surrogate of cobalt, cesium, and fluorescein was applied to the wire to provide post-demonstration evidence of the efficiency of the system to separate and collect contaminated materials and to ensure the copper remained uncontaminated. After pre-sizing and sorting, the contaminated wire was fed into the system where it was granulated. The granulated copper and insulation were mechanically sorted and collected for disposal. The bulk of the contamination was contained in the dust collection system. Any remaining contamination was fixed to the insulation. The copper was recycled and the insulation disposed of as filler in low-level waste disposal packages. The recycling process reduced the waste volume by 80 percent and provided 8 ½ tons of recyclable copper.

The In Situ Object Counting System for 'free release' of decontaminated areas (IFR) was begun in October 1999 and is expected to continue into early 2000.

The ICT is actively pursuing additional technologies for demonstration for FY 2000.

For more information:

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Canyon Disposition Initiative

Objective and Scope: The Hanford Canyon Disposition Initiative (CDI) Project is a collaborative project that includes participation across the DOE Office of Environmental Management (EM). Participating EM offices include the Offices of Waste Management Environmental Restoration, Science and Technology, and Nuclear Material and Facility Stabilization. This partnership is driven by the broad and significant impact that decisions made on the disposition of the canyons will have to all of these programs.

The CDI Project is evaluating the feasibility of using the five chemical processing facilities (canyons) as assets for disposal

of low-level wastes, instead of a mortgage liability to the Environmental Restoration (ER) Program. The U Plant facility is being used as a pilot for this evaluation. The U. S. Department of Energy, Richland Operations Office (RL) ER Program signed an Agreement in Principle with the regulators at the beginning of FY 1997, to conduct the evaluation for the disposition alternatives for the canyon facilities. In 1996, a Canyon Task Team of personnel from RL, the U.S. Environmental Protection Agency, and the Washington State Department of Ecology (known as the Tri-Parties) conducted a series of workshops to identify an approach for the long-term disposition of the five main processing facilities in the 200 Area (B Plant, T Plant, U Plant, Plutonium Uranium Extraction Facility, and the Reduction Oxidation Plant) at the Hanford Site. The assessment made by the Canyon Task Team centered on the possibilities of removing the processing facilities, leaving all or part of the facilities in place, and identifying alternative beneficial uses for the facilities. The team concluded that the technical approach for dispositioning any of the facilities could be bounded by the following six alternatives:

- Alternative 0:
  No Action
- Alternative 1:
  Full Removal and Disposal
- Alternative 2:
  Decontaminate and Leave in Place
- Alternative 3:
  Entombment with
  Internal Waste Disposal
- Alternative 4:
  Entombment with
  Internal/External Waste Disposal
- Alternative 5:
  Close in-Place—Standing Structure
- Alternative 6:
  Close in-Place—Collapsed Structure.

The Record of Decision for the 221-U Facility will generate regulatory and technical precedence for future disposition of the other four remaining processing facilities.

Current Reporting Period Activities: A Liquid Detection vendor was selected (Infrared) in past reporting periods and has completed its work on the Canyon Deck and the Galleries. The Innovative Technology Summary Report (ITSR) entitled "Non-intrusive Liquid Level Detection Technology" was submitted to DOE Headquarters for printing and distribution. Infrared, Inc. gave their "close-out" briefing to Hanford site representatives on December 16, 1999.

AIL was awarded the contract for 3-D gamma imaging in a past reporting period. The AIL deployment was successfully performed in the last part of August 1999. AIL provided their Draft ITSR and it is being reviewed by the Focus Area and staff of the Environmental Measurements Laboratory.

Preparation of the survey plan for the structural assessments, including the ventilation tunnel, has begun and the concrete coring unit has been procured. The concrete sampling will require the repair of the railroad tunnel roll-up door to provide access to both the railroad tunnel and the cells.

For more information:

http://bhi-erc.com/canyon/canyon.htm

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Demonstration of the Infrared-based Liquid Level Detection LLD technology as part of the Canyon Disposition Initiative.

Highly Selective Nuclide Removal System—Accelerated Site Technology Deployment

Objective and Scope: In 1992, the last of the five U.S. Department of Energy production reactors at Savannah River Site was placed into shutdown mode, with no intention to restart. With this action, the site entered into an extensive deactivation and long-term surveillance and maintenance life-cycle phase of these facilities. The integrity of the aging facilities has become a concern in recent years. Large volumes of contaminated water exist at some of these facilities at SRS (for example, fuel storage and disassembly basins). Treatment of this water requires removal of the water from the basin and shipment to the F and H Area Effluent Treatment Facility (ETF). A safe, cost effective technology is needed to process the basin waters on location and selectively remove radioactive materials without transporting the water to ETF. The technology must reduce targeted nuclides to near DOE release limits and condition the water for direct release. Efforts to address these concerns have been initiated under the current funding for reactor monitoring and are being incorporated into the overall facility deactivation, decontamination and decommissioning planning strategy. With the uncertainty of the basin integrity over time, a technology that can remove radioactive contamination from the basin water while minimizing secondary waste generation is essential to the success of the deactivation of the DOE reactor basins.

The Savannah River Site Accelerated Site Technology Deployment will deploy an innovative, highly effective water treatment system to remove selected radionuclides from millions of gallons of water. Overall deactivation and decommissioning life-cycle costs are expected to be significantly lowered via deployment of the technology.

Current Reporting Period Activities: 3M's Empore technology has been added to enhance this ASTD project. Specifically, 3M's technology will be deployed along with the original NURES system. Both systems will be used to remove cesium and strontium from five million gallons of basin water at R-Basin. The checkout, testing, and operator's training for the 3M Empore deployment will begin in the middle of January and will last for approximately six weeks. The deployment itself will include 10 weeks of operation for both strontium-90 and cesium removal. Deployment will commence at the end of February and continue through March and April.

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Mobile Work Platform—Accelerated Site Technology Deployment

Objective and Scope: This ASTD project involves a partnership between the Fernald Environmental Management Project (FEMP) and Idaho National Environmental and Engineering Laboratory (INEEL) to purchase and deploy a Mobile Work Platform (MWP) at Fernald and Idaho and potentially at other DOE sites including Hanford, Rocky Flats, and the Savannah River Site.

Five major complexes, Plants 7, 4, 1, Boiler, and 9, at the FEMP site have been successfully decontaminated and decommissioned (D&D) during the course of ongoing environmental restoration activities pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Major complexes Plant 2, Plant 8, and the Pilot Plant will undergo D&D activities in FY 2001 and FY 2002. In addition to the FEMP facilities, the INEEL Test Area North - Building 616 has also been identified as a deployment location.

To address the Sites' needs, FEMP and INEEL will develop a common specificati on and then purchase a Mobile Work Platform (MWP) that satisfies both sites' needs.

Status and Accomplishments: While the FEMP achieved cost and schedule improvements with each successive D&D project, the D&D of the major projects were expensive and labor intensive. Of particular concern during past, present and future D&D projects is the removal of 'process' piping. Removal of process piping presents two concerns. The first is a personnel safety concern. The workers, impaired by several layers of personal protective clothing and a full-face respirator, have to handle power tools while working off the ground on ladders, scaffolding, and/or man-lifts. The second concern is the close proximity, within inches, that the workers have to be to a radiation/contamination source (process pipe). This concern has been formally documented at the FEMP by the Site Technology Coordination Group (STCG), Need Number OH-F010, "Safe and Efficient Process Piping and Conduit Dismantlement". This is the highest priority of Fernald's documented D&D needs. Use of a MWP will remove the workers from the immediate industrial hazard and radiation/contamination zone, which will significantly increase the safety of the pipe/conduit removal process.

A Deployment Plan has been written and issued. Detailed requirements and specifications are being developed. Operator training and initial deployment will be completed by the end of FY 2000.

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Remote Size Reduction for Large Hot Cell Deactivation-Accelerated Site Technology Deployment

Objective and Scope: The 324 Building, located at the Hanford Site near Richland, Washington, is being deactivated to meet state and federal clean up commitments. The 324 Building has several highly radioactive tanks, tank vaults, piping, and large hot cells containing complex chemical processing equipment. To meet the cleanup commitments, there is a need to deploy more rapid and remote size-reduction, debris collection and removal, characterization, and decontamination methods. Readily deployable deactivation methods that reduce worker exposure, secondary waste generation, costs, and risks are also needed. Deployment of a remote/robot work platform in the 324 B-Cell with full reach capabilities will significantly accelerate work tasks, eliminate the need for multiple, specialized tool design and procurement, and reduce the overall program risks.

The Hanford Site Accelerated Site Technology Deployment (ASTD) project will fund the deployment of a robot work platform to support 324 B-Cell cleanup activities. Through this project, Hanford will procure and deploy a remote/robot work platform that is positioned with an overhead crane to perform deactivation activities. Following B-Cell cleanup, the work platform will be deployable for other 324 and Hanford site cleanup missions.

Status and Accomplishments: The solicitation was issued for the robotic work platform in November. The review team completed their efforts and a selection announcement is expected in January. Complete details of the system will be disclosed once the selection has been announced.

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Surface Contamination Monitor Accelerated Site Technology Deployment

Objective and Scope: The objective and scope of this Nevada Test Site (NTS), Accelerated Site Technology Deployment (ASTD) project is to deploy a Surface Con-

tamination Monitor and Survey Information Management System (SCM/SIMS) from Shonka Research Associates (SRA). The SCM/SIMS will be deployed at the Test Cell C facility, which was used for testing nuclear rocket reactors. The facility has a large exterior concrete pad and interior floor spacing requiring survey. The SCM/SIMS will be used for the characterization of concrete floors in order to expedite survey and closure at a reduced cost and risk. Use of SCM/SIMS is expected to be extremely beneficial in characterizing the Test Cell C facility, and is expected to be deployed at other NTS facilities including the Pluto facility.

Status and Accomplishments: The SCM/SIMS deployment at Test Pad C (at the Nevada Test Site) was successfully completed. A Cost and Performance Report is being developed, and it is anticipated that the report will be submitted to the D&D Focus Area by the end of January 2000. Specific deployment details will follow receipt of the Cost and Performance report.

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Los Alamos National Lab Decontamination and Volume Reduction System (DVRS)—Accelerated Site Technology Deployment

Objective and Scope: In cooperation with DOE/EM/OST (EM-50), the DOE-Albuquerque Field Office has assembled a team to resolve the DOE complex-wide problem of oversized metallic TRU waste disposal. Their mission being to provide advanced proven technology in pursuit of OST and the Accelerated Site Technology Deployment (ASTD) goals, the team will deploy a fully integrated relocateable Decontamination and Volume Reduction System (DVRS) initially at Los Alamos National Laboratory (LANL) and ultimately at other DOE sites. The Albuquerque DVRS Industrial team consists of representatives from the DOE Los Alamos Area Office and Los Alamos National Laboratory with prime contractor Nuclear Fuel Services, Inc., its subcontractors BNFL Instruments, Inc., MAC Corporation, Merrick and Co., and NFS-Radiation Protection Services, Inc., an affiliate company of NFS, Inc.

The DVRS has been deployed successfully in a multi-jurisdictional regulatory environment at the Nuclear Fuel Services-Naval Fuel Fabricating Facility in Erwin, Tennessee, where more than 680 m3 of TRU waste were processed. After processing, the TRU waste was shipped to Oak Ridge National Laboratory for interim storage, eventually recovering, packaging, and returning to DOE more than 8 kilograms of plutonium and 38 kilograms of uranium.

Providing the capability to process and dispose of approximately 2400 m3 of oversized metallic TRU waste currently in storage at TA-54 at Los Alamos within a substantially reduced operating period, the Albuquerque DVRS Industrial Partners will deliver the system to Los Alamos under a guaranteed fixed-price contract, ready for installation and operation 12 months after receipt of contract award. The majority of this TRU waste (currently non-certifiable in its present packaging configuration) will be processed to low-level waste, and then be cost effectively compacted and disposed of on site. Aside from existing waste volumes, it is anticipated that the DVRS will be deployed to process an additional 3000 m^3 of similar waste resulting from on-site D&D activities at other Los Alamos facility upgrade activities. These upgrade activities are essential to the Laboratory's role in stockpile stewardship.

Status and Accomplishments: Because of a two-hour fire rating (which requires that a fire inside the structure be contained within the structure for two hours), it was decided that refurbishment of the LSDDP dome and ASTD dome would be more costly and extend the schedule more than construction of a new metal building (i.e., Butler building) that would house both the LSDDP and ASTD DVRS projects. The design of the Butler building has started, and the DVRS

is expected to be operational inside the building in June 2000, which is about 11 months behind schedule. The Butler building will be located about 100 feet from the existing ASTD DVRS dome.

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http://www-emtd.lanl.gov/LSDDP/DDtech.html

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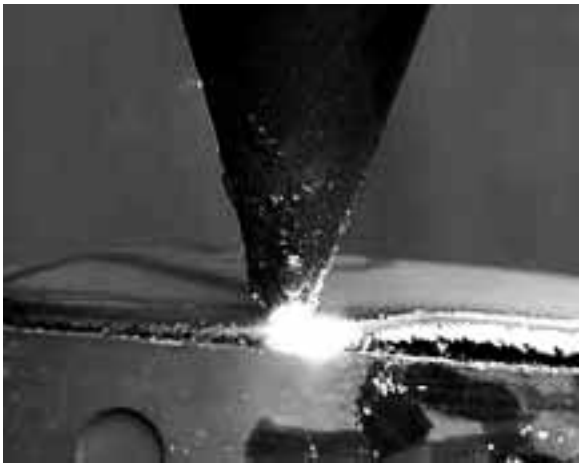

The Oversize Transuranic Waste Laser Cutting equipment from GSI Lumonics is used in ASTD to diminish the size of TRU waste to fit into WIPP containers.

Oversize Transuranic (TRU) Waste Laser Cutting System at the Nevada Test Site—Accelerated Site Technology Deployment

Objective and Scope: Deploy a laser cutting system at DOE/NV to reduce the size of contaminated TRU waste so that it fits into the WIPP shipping containers. Also, deploy the laser cutting system to Hanford and Rocky Flats to reduce the size of the TRU waste to fit the containers for shipment to WIPP. DOE-NV has a need to size-reduce and characterize 58 oversized TRU contaminated metal boxes (total volume of 270 cubic meters) prior to shipping them to the WIPP. The contents of these boxes are contaminated gloveboxes (32), a metal cutting lathe, lengths of metal piping, lengths of angle iron, and various scrap metal. The Hanford material requiring size reduction includes a minimum of 150 glove boxes (there are also ductwork and piping). There is actually much more material to be processed, but the economics in this proposal are based on 150. At Rocky Flats, the laser cutting system will also be applied to contaminated gloveboxes (proposal is based on 150).

Status and Accomplishments: The laser design and assembly team at LANL was given permission in December 1999 to purchase the laser system. They initiated the purchase of the laser cutting system on December 23, 1999, from the laser equipment integrating contractor, GSI Lumonics. The agreement to initially deploy the laser cutting system at LANL during FY00 is still not completely in place, but the problems are being resolved. The problem with the existing Safety Analysis Report for the Decontamination and Volume Reduction System (DVRS) project including laser cutting is being mitigated. The agreement letter is expected from LANL in the near future. The location of the laser cutting deployment at LANL is to be in the Los Alamos Technical Area 54, where the DVRS ASTD facility is now under construction. Materials to be size-reduced include stainless steel gloveboxes and other large metal items. Radioactive contamination levels of these materials are TRU and low level. The deployment is also to be coordinated with the ongoing LANL TRU Waste Characterization Decontamination and Disposition LSDDP.

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Personal Ice Cooling System (PICS)—Accelerated Site Technology Deployment

Objective and Scope: The objective of the Personal Ice Cooling System (PICS) (OST/TMS ID 1898) is to control the heat stress of workers. This project is designed to deploy the PICS personal protective equipment to Fernald's workforce as well as to other DOE sites. Fernald will also implement administrative and educational programs designed to overcome cultural barriers and replace the existing baseline with the PICS. PICS is a self-contained core body temperature control system that uses ordinary ice as a coolant and circulates cool water through tubing that is incorporated into a durable and comfortable, full-body garment (pants, shirt, and hood). Water is frozen in bottles that are worn outside/inside of Anti-Cs in a sealed, insulated bag with a circulating pump attached to a support harness system. An adjustable-rate, battery-powered pump circulates the chilled water through the tubing in the suit. The adjustable pump allows the worker to control his temperature based upon his workload, unlike "ice vests" where the initial cooling is often extreme and uncomfortable. The ice bottle, pump, and suit make up only 12 pounds, a relatively small load. This effort provides the project team with nearly 100 PICS units as well as several central chillers and all required support equipment. The team will deploy various PICS systems (the three-piece [hood, shirt, and pants] suits and/or vests) to each of ten additional DOE sites by a team of Fernald labor-union personnel. This team will conduct proactive workshops on the PICS and its benefits to the workforces at ten other DOE sites (Nevada Test Site, Hanford, Oak Ridge, Paducah, Savannah River, Rocky Flats, Pantex, Los Alamos, Sandia, and Mound). It is envisioned that the educational workshops coupled with leaving "seed" PICS systems will create a demand for the PICS at the other DOE sites. This approach to widespread deployment using experienced workforce personnel is similar to the successful approach Fernald used to achieve widespread deployment of the oxy-gasoline torch. Not only will Fernald see the cost savings realized by using the PICS, but other DOE sites will, as well.

Status and Accomplishments: During FY 1999, 80 PICS units were deployed at 11 DOE sites (Nevada Test Site, Hanford, Oak Ridge, Paducah, Savannah River Site, Fernald, Sandia, Los Alamos, Pantex, Rocky Flats, Mound). The deployments were timed to correspond with the beginning of the summer/heat stress season. In initiation of the deployments, training on the PICS was provided to over 200 people. Also, 25 PICS units and two central chilling units have been deployed (Laundry, Sample Line) at Fernald and an additional order within another division for 10 PICS ($15K). Feedback from all of the sites with regard to the deployments has been extremely positive. As a result, the PICS vendor received additional PICS orders in June from three sites (Savannah River, Paducah, Oak Ridge) and one in July from the INEEL; these all total around $65K. Rocky Flats, Pantex, and Sandia are considering the purchase of additional PICS cooling suits. Directly and indirectly related to this project, over 150 PICS cooling suits have been deployed across the DOE complex.

Current Reporting Period Activities: During the first quarter of FY 2000, the PICS was introduced to LLNL and a training/information session was conducted. The site is expected to deploy the technology during summer of 2000.

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Integrated Decontamination & Decommissioning – Accelerated Site Technology Deployment

Objective and Scope: The overall objective of the Integrated Decontamination and Decommissioning (ID&D) Accelerated Site Technology Deployment (ASTD) project is to increase the use of innovative/improved but

proven technologies on a large scale in the D&D of facilities in the DOE weapons complex. The reason for increasing the use of these innovative/improved technologies is that each has demonstrated improvements over current baseline methods in cost, schedule, waste generation, radiation exposure, or safety. Increased use on a large scale will be accomplished by doing actual D&D projects with the selected innovative/improved technologies, thereby increasing user familiarity and experience with them and adding them to the array of tools available for D&D projects. The technologies added to the D&D toolbox have all been proven on a smaller scale, either through demonstration in the Deactivation and Decommissioning Focus Area's LSDDPs or through commercial use, but they have not been used to decontaminate and decommission facilities across the DOE complex. After completing the ID&D ASTD project, the DOE expects to see increased use of these technologies that will result in ongoing cost savings at the Idaho National Engineering and Environmental Laboratory (INEEL), Fernald Environmental Management Project (FEMP), Argonne National Laboratory-East (ANL-E), and other sites in the DOE complex. The ID&D ASTD project will provide for implementation and deployment of a suite of 12 D&D technologies. These technologies will be deployed at over 20 deployment sites (facilities) at INEEL, FEMP, and ANL-E. The anticipated technologies included the: oxy-gasoline torch; track-mounted shear; hand-held shear; GammaCam; BROKK 250 demolition robot; Decontamination, Decommissioning, and Remediation Optimal Planning System (DDROPS); soft-sided containers; snap-together scaffolding; concrete crusher; Personal Ice Cooling System (PICS); lead paint analyzer; and alloy analyzer.

Status and Accomplishments: During the project, the FEMP project team performed D&D on nine facilities (3F, 3G, 8F, 22A, 24B, 38A, 38B, 39C, and 45B) and dismantled and demolished them utilizing the oxy-gasoline torch (OST/TMS ID 1847), hand-held shear (OST/TMS ID 2304), and track-mounted shear-crusher (OST/TMS ID 2303) technologies. At the INEEL, the following seven technologies were deployed in some 11 facilities during FY 1999: Oxy-gasoline Torch (OST/TMS ID 1847), GammaCam (TM) Radiation Imaging System (OST/TMS ID 1840), Remote Control Concrete Demolition System (OST/TMS ID 2100), D&D and Remediation Optimal Planning System (DDROPS) (OST/TMS ID 2322), Soft-Sided Waste Containers (OST/TMS ID 2240), EXCEL Automatic Locking Scaffold (OST/TMS ID 2320), and the Personal Ice Cooling System (PICS) (OST/TMS ID 1898). During the project, the Argonne-East team deployed a Remote Control Concrete Demolition System (OST/TMS ID 2100) for the demolition of the CP-5 reactor bioshield; they also used the Oxy-gasoline Torch (OST/TMS ID 1847) for cutting reinforcing bars in the concrete and other metals in the reactor service area.

Current Reporting Period Activities: In FY 2000, the INEEL project team is scheduled to deploy three additional technologies. These are the Excel Concrete Crusher (OST/TMS ID 2961), lead paint analyzer (OST/TMS ID 2317), and alloy analyzer (OST/TMS ID 2397).

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Release of Concrete for Recycle from Decontamination and Decommissioning Projects—Accelerated Site Technology Deployment

Objective and Scope: While most of the concrete waste generated during decontamination and decommissioning (D&D) activities is not contaminated, some portions are contaminated with radioactive or chemical constituents. Because of the difficulties and uncertainties associated with the unrestricted release of concrete, much of the uncontaminated concrete is treated as though it were

contaminated and is disposed as low-level radioactive waste. Even concrete that is shown to be uncontaminated is disposed either in a sanitary landfill, or is used as backfill. Disposal at a radioactive or sanitary waste site can be costly and eliminates the opportunity to economically recycle or reuse the concrete.

The Idaho National Engineering and Environmental Laboratory (INEEL) Accelerated Site Technology Deployment (ASTD) project, in collaboration with Argonne National Laboratory-East, will develop and test a protocol for the free release of concrete. The protocol, to be developed by ANL-E, will follow the ten basic steps for free release outlined in DOE Order 5400.5, and will be modeled after the protocol for the free release of scrap metal previously developed by ANL-E. In short, the protocol will be a decision tree that takes into account factors such as the type and level of contamination, volume and type of concrete, stakeholder and public approval, and the cost of decontamination. Based on this information, the protocol will outline possible disposition alternatives for the concrete and their relative costs. The protocol will be applicable across the DOE complex. Once the protocol is written, it will be applied to a test case at the INEEL to assist with planning decontamination and decommissioning of a facility. The protocols will then be shared with others within the DOE complex so that it can then be applied on a complex-wide basis to reduce the cost of D&D operations involving concrete removal by allowing for re-use of concrete that meets EPA regulations and DOE orders.

Status and Accomplishments: Although many relatively small facilities have previously been decommissioned at INEEL, many large facilities await decommissioning. Facilities such as the Engineering Test Reactor (ETR), Materials Test Reactor (MTR), Power Burst Facility (PBF), and a variety of waste handling and laboratory facilities will be decommissioned over the next several years. Each of these facilities contains massive amounts of concrete, which represents tremendous savings potential if it can be reused. The amount of contaminated concrete at the INEEL is estimated to be as low as 278,000 ft^3 and as high as 354,000 ft^3, while the non-contaminated concrete (including that in the landfill) is estimate at 7.7 million ft^3.

Current Reporting Period Activities: Due to funding constraints, it is currently anticipated that D&D of a facility containing contaminated concrete will not occur at INEEL in FY 2000. Thus, the ASTD project has been rescoped to concentrate on the development of complex-wide protocols for the free-release of concrete from D&D activities. These protocols will be tested in FY 2000 to assist with planning of a D&D project at INEEL. INEEL provided a packet of information requested by ANL-E to assist with development of the protocols. The packet included information such as existing release protocols, INEEL procedures, disposition and release methods, INEEL radiation detection equipment, and possible disposition alternatives. ANL-E will develop a rough draft protocol by February 2000.

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Deployment of Innovative Characterization Technologies and Implementation of the MARSSIM Process at Radiologically Contaminated Sites—Accelerated Site Technology Deployment

Objective and Scope: One of the most significant issues facing planners of decontamination and decommissioning (D&D) projects is the cost associated with characterization of the facility. There is uncertainty concerning the amount of data that needs to be collected and the level of analysis required in all phases of a D&D project, from the initial planning phase through the closure phase. These uncertainties make it difficult to define the full scope of a project at the outset and to prepare, with confidence, a feasible D&D schedule. This Accelerated Site Technology Deployment (ASTD) project plans to address some of the most important issues

associated with facility characterization through the implementation of the guidelines contained in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). Additionally, this ASTD project will augment the MARSSIM process through deployment of innovative in situ characterization technologies. This effort focuses on the characterization of the Brookhaven Graphite Research Reactor (BGRR), which is currently undergoing stabilization in preparation for near-term D&D.

Status and Accomplishments: The BGRR was a graphite-moderated and reflected, air-cooled, thermal neutron research reactor that operated from 1950 to 1968. In 1997, following safe shutdown of the BGRR facility during the 1970s and 1980s, a site-wide review found radioactive water in the underground air-cooling ducts. Subsequently, it was determined that a comprehensive investigation of the environmental vulnerabilities and overall facility condition should be conducted. The first phase of this stabilization effort involves characterization of the BGRR facility including the following structures and associated systems:

- Building 701, Reactor Building
- Building 702, Reactor Pile
- Building 704, Fan House
- Building 708, Instrument House
- Building 709, Canal House and Outdoor Pad

To date, the focus of MARSSIM, a regulatory guidance document developed collaboratively between DoD, DOE, EPA, and the Nuclear Regulatory Commission (NRC), has been for final status surveys used in determining if a remediated site/facility meets the applicable release criteria. The application of the MARSSIM process at the BGRR facility for initial investigation prior to remediation of decommissioning activities represents one of the first applications of this kind within the DOE complex.

Utilizing MARSSIM, the radiological and hazardous material conditions of the BGRR facilities will be determined. Cobalt-60 is one of the primary nuclides of interest. Other anticipated radionuclides are tritium, carbon-14, strontium-90, cesium-137, radium-226, uranium-235, and various transuranics. Knowledge of the existence and extent of the radiological and hazardous material conditions will enable timely stabilization of the facility, provide for necessary modifications and/or repairs, and establish the basis of any future decommissioning planning.

Current Reporting Period Activities: The BetaScint technology was deployed during a two-week period from December 6 through December 17, 1999. Originally the deployment was scheduled to coincide with the BGRR Pile Fan Sump removal action so real-time data on Sr-90 contamination levels in the soil could be collected as the dig progressed. Unfortunately, BGRR had to postpone the digging operation so numerous samples were collected from various environmental restoration areas at Brookhaven National Laboratory (BNL) that were potentially contaminated with Sr-90, as well as hand-dug soil samples in the vicinity of the BGRR Pile Fan Sump piping.

Four calibration standards were prepared from a NIST-traceable source and BNL soil that were used to provide site-specific calibration for the instrument. A total of 145 evaluations were completed (35 soil samples) using BetaScint and 11 samples are being sent to an off-site laboratory for conventional baseline Sr-90 analyses as a means of comparison. Final data review is being completed, but preliminary results indicate that the system can provide accurate, repeatable, and rapid (5 min. count times) Sr-90 results for soils using a field deployable laboratory system. Based on these results, plans are to purchase a BetaScint system for continued deployment in support of the BGRR Decommissioning project.

For more information:

OST/TMS ID 2374

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Rocky Flats Environmental Technology Site—Accelerated Site Technology Deployment & the D&D Initiative

To address technology needs and opportunities at the Rocky Flats Environmental Technology Site (RFETS) and positively impact the site's ability to meet its 2006 site closure plans, DDFA has partnered with Rocky Flats on several projects. These projects include:

1. The Fiscal Year (FY) 1998 Accelerated Site Technology Deployment (ASTD) Project
2. The FY 1999 ASTD Project
3. The Rocky Flats D&D Initiative

These projects confirm that application of new, proven technologies can accelerate D&D activities and significantly reduce site closure costs.

Inner Tent Chamber (ITC) for glovebox size reduction, Rocky Flats

Status and Accomplishments:

FY 1998 ASTD—Enhanced Deactivation and Decommissioning (D&D) of Gloveboxes

1. Crimper Cutters Tools—The large Crimper/Cutter tool (designed to crimp/seal pipes and then cut them) was returned to the vendor under a performance warranty. It did not perform satisfactorily. A small, 2"-pipe cutter is expected to be deployed in Building 771 during the first half of FY 2000.
2. DISPIM™—The Decommissioning In Situ Plutonium Inventory Monitor (DISPIM™) was first deployed on site in September 1998. The deployment was considered successful, and it is now being implemented on site. Documentation of the deployment is complete and a video has been prepared.
3. WIPP Certified Standard Waste Box (SWB) Crate Counter —The counter is currently undergoing calibration and validation at LANL. The mobile SWB counter is a self-contained, trailer-mounted system that can be easily transported around the Site and between DOE sites. The system is based on passive neutron coincidence detection assay technology, which is similar to the technology that has been successfully used for WIPP-certified drum counters. The unit is expected to be WIPP-certified and operational at Rocky Flats in March 2000.

FY 1999 ASTD—Remote Operation Size Reduction Station (ROSRS)

Building 776/777 at Rocky Flats is a former plutonium machining building that is currently undergoing D&D activities. This two-story structure contains large quantities of piping, gloveboxes, and tanks. Waste types generated will likely include sanitary, hazardous and various low-level, TRU, and mixed, radioactive wastes.

ROSRS will allow size-reduction to be performed by a remotely operated system rather than manually by workers in supplied breathing air with many layers of personal protective equipment and using hand-held cutting tools.

Rocky Flats D&D Initiative—Two projects were completed in FY 1999 under the D&D Initiative. They were:

1. Mechanical cutting tools were purchased and installed in an Inner Tent Chamber

(ITC) size-reduction station. The ITC's function is to remove the worker from the atmosphere where size reduction is taking place to improve worker safety and reduce worker exposure risk.

2. A User Requirements Document and Feasibility Analysis for a Centralized Site D&D System were generated and reviewed.

FY 2000 Initiative dollars will be divided into two parts: 1) $1M will be used to support the ROSRS project, and 2) the remaining funds (approximately $500K) will be used in another fashion to support D&D at Rocky Flats.

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Deactivation & Decommissioning (D&D) Consortium

Objective and Scope: In December 1997, DOE signed a Memorandum of Understanding (MOU) with the Electric Power Research Institute (EPRI) and several nuclear utilities to jointly develop and deploy new D&D technologies. DOE's objective is to expand the reach of benefits of the leading-edge technologies being deployed within the DOE nuclear complex. The MOU Consortium established a charter in early 1998 and identified challenging technological areas common to both DOE and the commercial industry. Both DOE and commercial sites will be used for these demonstrations and deployments.

DOE and EPRI are collaborating to conduct quarterly workshops at various nuclear plants around the country, each focusing on a particular decommissioning area. DOE and the utilities present the most recent, innovative technologies to improve productivity and worker safety while reducing cost. The workshops will solicit feedback from "hands-on" plant managers and field workers. Topics covered to date address: concrete decontamination, imbedded pipe decontamination, and site characterization.

Status and Accomplishments: The efforts supporting the DOE/EPRI/Utility Consortium during the past quarter concentrated on the development of a technology demonstration process to be conducted at utility plants. A series of questionnaires has been developed which can be used to center discussion on the technology needs in the utility industry, the goals of demonstrations, and the bases of specific demonstrations.

The work is centered on the current needs of the Rancho Seco plant. The D&D team at Rancho Seco is very interested in providing their facility as a test bed for the demonstration of new technologies. Current concentration is on concrete cleaning and cutting of stainless steel pipes and vessels. The use of the general questionnaire should assist in ascertaining the needs of other facilities. During the upcoming period this will be presented to the Consortium.

Two specific demonstrations are being scheduled at Rancho Seco during the first half of 2000. The Marcrist Concrete Shaver will be demonstrated during March. Both the floor and wall units will be demonstrated using the turbine building at Rancho Seco as the site. A detailed draft test plan has been prepared and is undergoing review at the plant and also by others in the Consortium.

The second demonstration will be performed by FIU. FIU is developing a concrete floor and wall cleaning system that will include a measurement system that will allow the operator to monitor the progress of the decontamination as the work proceeds. This demonstration will follow the Marcrist demonstration.

An EPRI/NETL workshop on low-level radioactive waste processing and minimization is being planned. NETL will provide information on DOE activities that can be incorporated into the EPRI workshop. This workshop will be held on March 14 - 15, 2000. The information will concentrate technology that has been demonstrated and documented in NETL and DOE programs. NETL will assist in the identification of these technologies and vendors. Where possible, NETL will identify presenters and/or the location

of information related to the technologies. NETL will also provide basic information on the NETL program and on where the utilities can obtain applicable data on past, current, and future NETL projects.

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Florida International University

Objective and Scope: The Hemispheric Center for Environmental Technology (HCET) at Florida International University (FIU) in Miami, Florida, is working on several D&D-related research projects under a grant awarded by the DOE Office of Science and Technology. These FY 2000 projects include:

- Deactivation and Decommissioning Technology Assessment Program
- Integrated Vertical and Overhead Decontamination System
- In Situ Pipe Decontamination System
- Technology Information Management and Dissemination
- Size Distribution and Rate of Production of Smoke and Particulate Matter During the Cutting of Metals
- Mercury Contaminated Material Decontamination Methods Investigation and Assessment
- PCB Contaminated Coatings Treatment System Development
- Technical Assistance and Response Development
- Online Measurement of the Process of Decontamination
- Remote Surveillance of Facilities Awaiting Deactivation and Decommissioning
- Volumetric Lead Assay

Status and Accomplishments and Current Reporting Period Activities:

Deactivation and Decommissioning Technology Assessment Program: This project was developed to provide detailed, comparable data for environmental technologies and to disseminate this data to D&D professionals in a manner that will facilitate the review and selection of technologies to perform decontamination and decommissioning.

FIU-HCET received three (3) bid proposals in November 1999 for the Glove Box and Tank Size Reduction Assessment. After the proposals were reviewed, the contract was awarded to Framatome Technologies. Framatome Technologies will demonstrate seven (7) technologies as part of this assessment.

- Plasma Arc Torch
- Hydraulic Shear
- Pneumatic Abrasive Cutoff Tool
- Portable Bandsaw
- Portable Reciprocating Saw
- Pneumatic Chisel / Scraper
- Electrical Hole Saw

The Laser Coating Removal System was demonstrated at the FIU-HCET in October 1999 by General Lasertronics Corporation. The objective of the demonstration was to remove rust from carbon steel plates and I-beams. The Model A600 laser coating removal system is a fully portable laser-based coating removal and decontamination system. The system consists of four (4) primary components, the Laser Power Unit (LPU), workhead, interface module, and umbilical hoses. The operator places the workhead against the work surface, and while viewing progress through a built in video viewfinder, controls laser firing by using triggers incorporated into the workheads handgrips. The residue of stripping is vacuumed into the Model A600 filter system. With a low production rate, the technology managed to remove the epoxy paint and the anti-corrosive paint from a steel plate and I-beams, respectively. The rate for epoxy coating removal on the plate was 0.29 ft^2/hr, nearly twice as fast as what the technology prototype demonstrated in 1997. The rate for removal of a softer anti-corrosive paint from the I-beams was 2.18 ft^2/hr, more than nine (9) times as fast as the prototype. Demonstration of rust removal was not successful. Instead of removing the rust, the system appeared to deoxidize the top layer of the rust. The

technology required simple setup, and no personal protective equipment. It also created a safe work environment, little noise, no airborne dust, and almost no secondary waste was generated.

Integrated Vertical and Overhead Decontamination System: This project, which commenced at the beginning of FY 1998, will be used to fabricate and test a cost-effective system with which to characterize and decontaminate vertical and overhead structures. This innovative technology will be capable of removing thick layers of coatings from smooth metal surfaces and will scabble 1/4 to 1/2 inch of concrete from concrete floors, walls and ceilings.

Redzone Robotics is scheduled to deliver a field-ready system in January 2000. Discussions with the Electric Power Research Institute have been initiated to explore the possibilities of deploying this system at Rancho Seco Nuclear Plant. A tentative meeting has been scheduled in January 2000, at Rancho Seco, to discuss the details of this possible demonstration.

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AEA Technology DDFA Projects

The Department of Energy (DOE) engaged AEA Technology, through an International Agreement, to bring a UK perspective to U.S. decommissioning activities within the DOE-complex. AEA's contributions are broad in nature and include planning as well as specific technology contributions. Through this International Agreement with DOE, four new D&D-related Project Technical Plans (PTP's) have been initiated for FY00. The concept and scope for each of these PTP's is briefly discussed as follows:

Demonstration and Deployment of a Passive Ventilation Device for D&D Activities at the Savannah River Site: Ventilation control has classically been conducted using a pressure sensor, controller, valve actuator, and mechanical air-regulating valve to vary the flow of air and the depression in a system. Should the dynamics of the system under control vary, there is a finite time for the mechanical system to adjust while the signal from the pressure sensor travels to the controller as it opens or closes the mechanical valve to regulate the flow. The system is always lagging behind what is happening in the unit under control, and under certain conditions this can be detrimental to operations and/or hazardous to workers.

To overcome this situation in the UK, AEA developed a non-mechanical, part passive ventilation valve that responds instantaneously to the behavior of the system. This device, known as a Vortex Amplifier or VXA, has no moving parts and is maintenance free. It is able to react instantaneously to pressure variations in a system, and is therefore inherently more reliable and more efficient than conventional pressure equalizing systems. The scope of this PTP is to design, fabricate, and demonstrate two vortex amplifiers for separate applications at the Savannah River Site, offering a reliable, proven alternative with a better track record as compared to conventional mechanical systems.

***Demonstration and Deployment of Soft Media Decontamination Techniques for Various Applications at the Savannah River Site*:** DOE has a large inventory of contaminated lead currently stored throughout the complex with more being added as DOE and its contractors decontaminate and decommission facilities. For example, the Savannah River Site currently has 200 to 300 tons of stored lead that must be decontaminated in an efficient, cost-effective manner. The Argonne National Laboratory and Idaho National Engineering and Environmental Laboratory also have a similar problem and have expressed a need to identify a cost-effective and reliable technology with a proven track record to decontaminate lead prior to final disposal.

AEA has extensive experience in designing, building, and operating pliant media blast

systems in high radiation environments, particularly in the commercial nuclear sector. Therefore, although pliant media decontamination is not a new technology, it has not been extensively demonstrated or deployed in the DOE complex for these applications. In this PTP, AEA will use its commercial deployment experience to perform a hot demonstration of lead brick decontamination at the Savannah River Site. Demonstrating the effectiveness of the sponge blasting system is expected to lead to future deployments throughout the complex.

The Savannah River Site has also expressed a need for a decontamination technology for contaminated tank riser plugs and pump transport vessels. In addition to performing the hot decontamination demonstration on contaminated lead bricks, AEA will demonstrate the effectiveness of the pliant media blast system on a contaminated tank riser plug. During the operation phase of these demonstrations, AEA will train Savannah River staff on proper procedures for decontaminating these components using a sponge blasting system.

Inspection, Sampling, and Remediation Options for Tank 105 in the HLW Vault in Building 324 at Hanford: To date, the DOE complex has primarily focused on closing large radioactive tanks and decontaminating and decommissioning smaller, low-level radioactive tanks at the various sites. In the coming years, several high profile projects that involve highly radioactive waste tanks will need to be inspected, characterized, emptied, and then dismantled. Due to the significant radiation dose and costs associated with these activities, an innovative, integrated approach to these activities is needed, which will deliver significant benefits in terms of increased safety, reduced costs, and shortened schedules.

As part of the overall decommissioning plan at the Hanford site, it is planned to close Building 324. One of the major projects involved in closing this building is the removal and disposal of four tanks in the high-level waste vault located beneath the hot cells in the building. These tanks, T104, T105, T106, and T107 are of the classic "Idaho" design and have limited access with all pipes having fully welded connections.

The purpose of this PTP is to conduct a feasibility study to examine several key aspects of the preparatory work leading to the temporary use and eventual D&D and removal of Tank 105. The principal stages of this process are envisioned to be:

- Inspection—deployment of a visual/imaging system into the tank to view the internals
- Radiation monitoring—to get an accurate radiation measurement
- Sampling—retrieval and analysis of a sample of waste to determine waste composition
- Decontamination—removal of the tank waste contents

This PTP will develop an integrated strategy for conducting all of these preparatory tasks using, in all likelihood, a single point of entry into the tank. Streamlining this preparatory work will reduce dose uptake to workers, reduce costs, and shorten the overall timescales, allowing remediation of Tank 105 to be accomplished earlier in the deactivation schedule.

Demonstration of Tension Diamond Wire Cutting System for the Cutting of Complex Steel Components, Including Components with Extensive Internal Voidage: An alternative system to wrap-around diamond wire systems has been used in the UK for the size-reduction of large, hollow steel components, in radioactive environments. This method is to tension the diamond wire on a frame, and then to use the wire in a similar manner as a band saw. As the length of the wire remains fixed for the duration of the cut, adjustments to the wire tension and feed of the wire can be carried out remotely. Also, continuous wires can be used, thus eliminating the crimp connector, which is used to join the ends of the wire for the wrap around systems. Failure of the crimp joint is a major cause of wire breakage during cutting.

Through this PTP, AEA will undertake a series of demonstration cuts using a tensioned diamond wire system to cut large, heavy-walled steel components. The components selected will be representative of items

that are routinely encountered within the DOE complex, and will evaluate key technical and cost savings aspects of this cold cutting technique.

Current Reporting Period Activities:
A planning meeting is set for mid-January at the Savannah River Site regarding a planned Charlotte "cold" demo and subsequent deployments of the ventilation system control systems (Vortex Amplifiers) at the site. AEA will supply two Vortex Amplifiers to the Savannah River Site, one amplifier being for D&D tent applications and the other amplifier being for glovebox suite applications.

Test plans for deploying pliant media blasting technology to decontaminate lead bricks/sheets and tank riser plugs will be provided to the SRS and DDFA in mid-January for review and comment. AEA is anticipating that media blasting of the riser plugs will begin at SRS in late February, contingent on training requirements.

AEA is scheduled to present an implementation plan for inspection, sampling, and remediation alternatives for Tank 105 (324 Building) to Hanford and DDFA representatives in early February. This plan will outline the path forward for the remainder of FY 2000, including an updated schedule. AEA met with Hanford site representatives in December to perform an area walkdown and to finalize the project scope.

AEA is working with DDFA to potentially demonstrate the Tension Diamond Wire Cutting system at the INEEL Site. Once the demonstration site is determined, AEA will finalize the test plan and the project schedule.

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2.2 Facility Characterization

Portable X-Ray K-Edge Heavy Metal Detector

Objective and Scope: Ames Laboratory and Iowa State University's Center of Nondestructive Evaluation are developing an improved nondestructive assay (NDA) technique for detecting and quantifying uranium, plutonium, and other heavy metals. The work is focused on situations where these materials are located inside sealed containers or processing equipment. The approach this technology uses is based on observing the K-edge absorption transition in x-ray transmission measurements. This technique is being developed to maximize the sensitivity for detecting heavy metals while minimizing the measurement time.

A project study showed that the K-edge heavy-metal detection technique would be beneficial for many D&D projects, especially those involving gaseous diffusion plants. Its use could have the biggest impact in inspecting the vast amount of piping in the plants. This inspection could be done in situ to allow monitoring of chemical flushing. The high sensitivity of the technique can be used to minimize the danger of contamination to workers and equipment during disassembly operations, resulting in savings of time and money in addition to reducing generation of waste.

Status and Accomplishments: During the first year of the project, FY 1994, the sensitivity of the technique was determined through modeling and laboratory demonstrations, ending with a design of a portable system. In FY 1995 and FY 1996, a prototype portable K-edge heavy-metal detector was assembled and tested in the laboratory. This system consisted of a high-flux x-ray generator, a collimator for minimizing the local radiation hazard and providing the requisite beam characteristics, a monochromator, a real-time imaging detector for simplified alignment, and an energy-dispersive detector for collection of the K-edge data. The equipment, including the x-ray generator and detectors, is controlled by a personal computer. The same PC analyzes the raw data, with the result being made available to field personnel. Sensitivity comparable to the original laboratory tests was achieved, and measurement time was reduced by a factor of two. A 2-mm layer of uranium was successfully measured through 1 in. of steel. The K-edge system analyzed thorium contamination in seven drain lines in Wilhelm Hall. Minimal contamination was found in two lines, significant thorium contamination in three lines, mercury contamination in one line, and one case of a drain trap contaminated with uranium, thorium, and mercury. This was the first true in situ demonstration of the K-edge system. The K-edge system was demonstrated at the Savannah River Site to measure the amount of highly enriched uranium (HEU) in the rooftop ventilation ducts for the Machining Room lathes. Sixty-six wide-angle images and 66 narrow beam spectroscopic shots were made during the demonstration. Approximately 84 feet of ventilation duct were assayed. When gram quantities were found, the precision was in the ±3% range. About one quarter of the narrow beam measurements identified a significant amount of HEU.

Current Reporting Period Activities: No activities to report this quarter.

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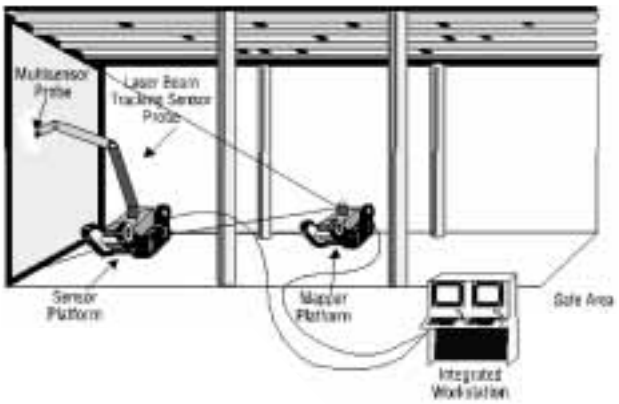
The K-edge technology is effective even through 1-inch-thick steel.

Three-Dimensional Integrated Characterization and Archiving System (3D-ICAS)

Objective and Scope: Coleman Research Corporation (Coleman) will develop a remote system that can rapidly analyze in situ hazardous organic and radionuclide contaminants on structural materials. This remote system is the Three-Dimensional Integrated Characterization and Archiving System (3D-ICAS). The 3D-ICAS consists of a mobile sensor platform and a mobile mapper platform that operate in contaminated areas, and an integrated workstation that remains in a safe location. Development of this technology will occur in three phases.

Status and Accomplishments: The 3D-ICAS was successfully integrated with mobile platforms at Oak Ridge National Laboratory. The Coherent Laser Radar Mapper was operated on the OmniMate robotic platform and the contaminant analysis units and robot arm carrying the multisensor probe head were integrated on the overhead transporter. The system was subsequently demonstrated at Oak Ridge National Laboratory, Robotics & Process Systems Division in October 1998. The demonstration was conducted in the hi-bay area using a wall unit specially constructed for the demonstration. The wall unit consisted of pieces of cement-based wallboard and a small piece of an asbestos containing material. The wall unit was purposely contaminated with low-levels of organic materials, alpha emitters, and a beta emitter. The demonstration consisted of mapping the wall unit, displaying the map, selecting points to be surveyed, running the contaminant survey, that required moving the sensor/analysis unit with the transporter and acquiring the sensor unit with the 3D mapper, displaying the measured contamination in real time, and displaying detailed spatial and contamination data after the survey was completed. An unfortunate hardware failure the morning of the day before the demonstration prohibited acquisition of contaminant data from the high-speed gas chromatography/mass spectrometry (HSGC/MS) and only the Molecular Vibrational Spectrometer (MVS) provided real-time identification of the substrate material during the demonstration. This was a significant success since the MVS correctly identified the wallboard as being cement even though the particular substrate sample had not been included in the system's neural network training set. Failure of the HSGC/MS was unfortunate, but its performance had been well documented and demonstrated prior to the demonstration at ORNL and it did not detract from the main objective of the demonstration, which was to show end-to-end system operation with the 3D-ICAS mounted on ORNL mobile platforms. The GC/MS was shipped back to Thermedics and they are in the process of replacing the parts and recalibrating the system. When complete the system will be shipped to the DOE-EM Laboratory in New York City for the validation testing.

Current Reporting Period Activities: The system is ready for integrated testing. Prior to the actual field demonstration at Florida International University (FIU), the latest enhancement on 3D-ICAS will be tested and debugged at Coleman's Woburn facility. Once the system is at the site, tests will be run to ensure that the equipment is properly operational. The equipment will then be ready to begin field demonstration. The purpose of this demonstration is to show the operation of the system mounted on the mobility platform. The platform conveys the coherent laser range



Three-Dimensional Integrated Characterization and Archiving System (3-D ICAS) is a remote mapper and sensor platform to use in contaminated areas.

mapper, sensing robot arm subsystem, contaminant analysis unit, and multi-sensor probe. FIU is interested in performing the demonstration in mid-February, as they want to understand the 3D-ICAS capabilities and identify surrogate samples. During this time, Coleman will maximize the software conversion efforts to replace the multiple user interface. This will result in more stable operation and control of the subsystem.

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Fast Response Isotopic Alpha Continuous Emissions Monitor

Objective and Scope: The objective of this effort is to develop and test Continuous Air and Emission Monitoring (CAEM) instrumentation for alpha-emitting radionuclides. This instrument will be designed in order to certify the proper performance of airborne emissions from ambient air and in equipment emissions encountered during D&D of DOE's surplus facilities. The proposed system will also meet DOE's alpha CEM requirements through the development of an innovative, high-resolution, on-line air/gas alpha monitor. The instruments will be capable of operating either as a stack emissions monitor, a process control instrument, or for the control of off-gas from decontamination, dismantlement, and air handling equipment.

Initial efforts will be focused on the development and evaluation of a rapid alpha-counting-based instrument to monitor ambient air and emissions to meet the monitoring and equipment control needs of surplus facilities undergoing decontamination and decommissioning. This development will establish the feasibility of a prototype instrument for use in detecting radionuclides that are present, or create susceptibility to exposure, throughout the DOE complex. The prototype instrument will be tested under the supervision of DOE's Inhalation Toxicology Research Institute in Albuquerque, New Mexico. Based on the prototype results efforts may be continued to full-scale commercial prototype for demonstration in one of the DDFA's LSDDPs.

Informal meetings were held with various DOE CAM end users. For example, the personnel associated with Los Alamos National Laboratory's (LANL's) upgrade of their continuous air monitoring system for the Plutonium Facility at Technical Area 55 (TA-55) continue to be very interested in the further development of the Fast-Response CAM. LANL was interested in hosting the Phase II field test at the LANL TA-54 LSDDP.

Current Reporting Period Activities: Thermo Power's Continuous Alpha Air Monitor Nears Completion. The prototype CAM instrument was operated this month to obtain additional performance and reliability data. These data were obtained for the improved, parallel-flow airflowarrangement described last month. With the improved, parallel-flow air inlet, signal response of the prototype CAM instrument remained within 6 percent of that reported last month. Additional testing will be conducted, in order to provide additional characterizati on of the prototype CAM system's operation and performance. For example, a determination will be made of the response of the CAM system to various changes in sample air flow rate.

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2.3 Facility Decontamination

High Productivity Vacuum Blasting System

Objective and Scope: The objective of this project is to improve the productivity and economics of existing vacuum blasting technology, which is used to remove radioactive contamination, PCB's, and lead-based paint and provides worker protection by continuously recycling the material and dust from the decontamination tasks. This work will focus on re-designing and improving existing vacuum blasting components, including: blast head nozzles, ergonomic handling of the blast head by reducing its weight, brush-ring design, vacuum level regulator, efficiency of dust separator, and operational control sensors. The redesign is expected to enhance the productivity and economy of the vacuum blasting system by at least 50 percent of current vacuum blasting systems.

LTC Americas will develop the necessary mathematical models of air-particle flow in the nozzle, in the blast head and interface area, and in the dust separator to study the flow characteristics and interaction of the various elements of the system. The purpose of this model development is to increase the productivity and economy of existing vacuum blasting technology by 50 percent. Based on the results of this modeling effort, the contractor will experimentally test and verify that the above system components perform according to the mathematical simulations and complete the preliminary design of the components of the proposed system. This will include an overall configuration of the system including: material selection and testing, definition of the range of dimensional and weight parameters, conceptual arrangement or design of the blast head unit, and dust separator unit. Based on the prelim-inary design, the contractor will procure components, and perform fabrication and assembly of the proposed system.

The performance of the system will be evaluated in the laboratory mock-ups representing various clean-up situations and environments. The contractor will review, analyze, and interpret data collected from the tests and develop a productivity enhancement profile of the pre-prototype unit including economic analysis. Based on the laboratory test results, the contractor will modify, change, and make adjustments to enhance the capability of the system.

Status and Accomplishments: Phase I has been completed. In Phase I, mathematical models and related code to simulate the entire process numerically were developed. Based on the data from the model, an innovative rectangular nozzle and a new centrifugal separator were designed, manufactured, and tested. The tests were performed to verify the mathematical models. The numerical results agreed with the measured data with a deviation within 10 percent. Experimental results also showed that if the new inno-vative design rectangular nozzle replaces the old circular nozzle, more than a 50 percent increase in productivity efficiency could be achieved. The newly designed centrifugal separator offers a high-efficiency separation increase from about 30 to 75 percent, even using finer abrasives.

Phase II has been initiated. In Phase II, a pre-prototype of the nozzle, blast head with wind curtain, sensors and dust separator will be designed, constructed and tested to assess the performance of the new design under controlled conditions at the contractor's facility.

Current Reporting Period Activities: The contractor is experiencing continued delays in having the prototype nozzles fabricated. Due to this, the test of the prototype system has been changed to mid-April. An alter-native to testing at a DOE site for the commercial prototype in Phase III is being considered, due to scheduling delays atDOE demonstration plant sites.

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2.4 Facility Dismantlement and Material Disposition

Demonstrations of Light-Aided Technologies for Hanford D&D Projects

Objective and Scope: Pacific Northwest National Laboratory (PNNL) is demonstrating a laser-aided cutting technology with a 2.4-kW neodymium-doped yttrium aluminum garnet (Nd:YAG) laser system for the size-reduction of materials and equipment in high-radiation environments to assess its applicability to dismantlement efforts at Hanford and other DOE sites.

The B-Cell Cleanout Project at the Hanford 324 Building has necessitated the removal and size-reduction of several large, multi-ton chemical processing racks. The project has used commercial saws and hydraulic shears, a plasma torch, and a water knife to cut up equipment in the hot cell. Each system has drawbacks, including low cutting rates, high waste generation, or applicability to a narrow range of metals and geometries. Nd:YAG laser systems are used for metal cutting in automotive facilities worldwide and they are used in many other manufacturing plants. The focus of this demonstration will be remote use of a fiber-fed laser cutting system: (1) to size-reduce materials in a low-radiation, remote-handled environment (cold test), and (2) to size-reduce equipment with minimal secondary waste generation and assess the capability, performance rate, and effective life span in a high-radiation, remote-handled environment (hot test).

At the end of the cold test, a review will be conducted to determine whether the laser system should be tested in the radioactive environment of the B-Cell. Project staff will conduct the review with input from building, laboratory safety, hot cell operations, and DOE-RL staff. The hot test will involve using the laser cutting system in the B-Cell to size-reduce Tank 119. Other materials in the hot cell may also be cut. Five sets of high-range dosimeters will measure the dose to the fiber optic cable to assess any degradation in quality of the laser cutting system during the hot test.

Status and Accomplishments: PNNL signed a partnering agreement with the Lumonics Corporation of Livonia, Michigan, in September 1996 to provide equipment for the laser-cutting demonstration. The laser system was received at PNNL shortly thereafter. Support equipment for the demonstration has been fabricated, and safety documentation and permits have been obtained. The test requirements document has been completed. The test articles have been identified, and the test procedures have been drafted.

Current Reporting Period Activities: The draft Innovative Technology Summary Report is being prepared.

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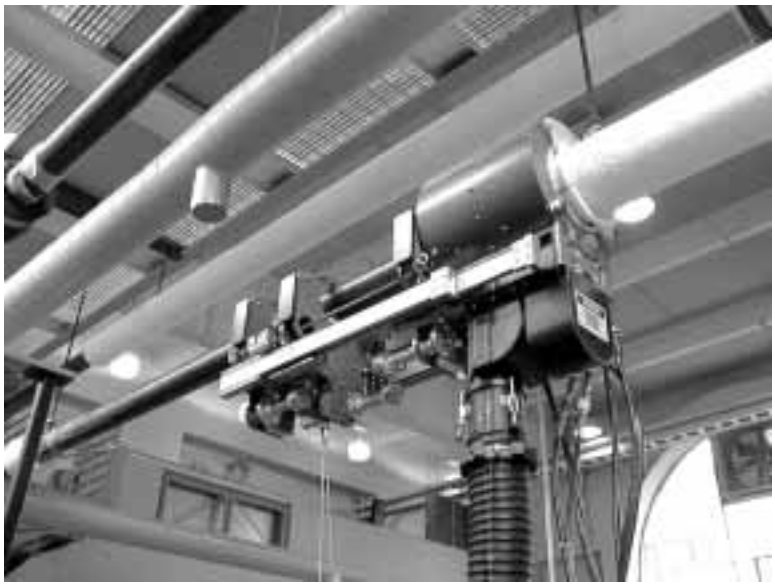
Asbestos Pipe Insulation Removal System (BOA)

Objective and Scope: Most of the steam and process piping in DOE facilities is clad and insulated with asbestos containing material (ACM), which must be removed before any decontamination and dismantling activities can occur. Manual removal is expensive and time consuming because of the carcinogenicity of asbestos fibers, radiological contamination, and abatement regulations of EPA and the Occupational Safety and Health Administration. Carnegie Mellon University (CMU) is developing and demonstrating a mechanical asbestos removal system that can be remotely operated without a containment area. This technology, known as BOA, is a pipe-crawling, asbestos-removal robot supported by a mobile, boom-vehicle robot that places the pipe-crawling robot and then seals and bags removed asbestos.

Development of the BOA technology will occur in two phases over a two-year period. Phase I will develop a prototype BOA pipe-crawler robot. Phase II will integrate the BOA pipe-crawler robot with the boom-vehicle robot.

Status and Accomplishments: Development of the prototype BOA pipe-crawler robot is complete. Laboratory demonstrations were completed at CMU and a field demonstration was completed at Oak Ridge in the back of K-1210 on the old K-25 site (now ETTP) in Oak Ridge, TN. Air quality was independently monitored and found to be far below (by factors of 6 and 2, respectively) the EPA established limits of 0.1 fibers/cm3 over an 8-h time-weighted average period and clearance samples below the maximum of 0.01 fibers/cm3 for a 1500-L air sample. The two-operator scenario was demonstrated and shown to be workable, with all on-pipe and off-board logistics equipment essentially operating autonomously. During the field demonstration it became clear that it would be advantageous to harden certain features of the on-pipe system to allow it to work on the more prevalent 3-inch pipe at K-25 and Y-12.

The Asbestos Pipe Insulation Removal Robot System, dubbed BOA, placed second in a national design competition hosted by the renowned Design News trade journal/ magazine. BOA was selected from a large number of national entries, and it was judged one of the most innovative new designs and products in the United States in 1997/1998. Based on the performance of a robot abating at a rate of 30 linear feet per hour, compared with about 3 to 6 feet in DOE/industry, with associated per-foot abatement cost ranging between $25 and $150 for DOE/industry, it was determined that substantial savings could be realized with the use of such a robot system. Overall abatement costs could decrease between 25 and 50 percent depending on whether the system replaces a current glove-bag or full containment method. The BOA system will assist DOE in reducing the cost of asbestos abatement as part of decontamination and dismantlement activities across the weapons complex.



The complete system was tested on long runs and hanger-passes for 3-inch diameter piping. The complete on-pipe abatement head and off-board logistics system was hardened through lengthy and exhaustive abatement runs, all of which were performed on lagged insulation, including many hangers. The abatement productivity and reliability was maintained and the viability of using the system on 3- and 4-inch diameter piping was certified.

The BOA robot was delivered to the Pentagon Wedge 1 Renovation Project in late June 1999. The robot abated a total of 6 feet, while running into continual problems with a very thick canvas-layer covering the insulation—the cutters continually wrapped and clogged themselves with the canvas cloth, thereby impairing its ability to fully cut the insulation without continual manual clearing of the coverhead. The robot had to be shut down and cleaned out. Testing could not be resumed because the BOA system was totally immobilized. The Team diagnosed the problems over many hours and found that the failed canvas-cutting attempts had actually blown two amplifiers. They repaired one, but the second one had been completely shorted-out, due to flooding in one of the robot chambers (when the robot got stuck on the canvas, spraying cutting water without progressing, the overflow flooded the forward equipment chamber). The BOA testing could not be completed to the liking of the International Union of Operating Engineers and the National Institute of Building Supplies (NIBS). They do not have enough air data, even if the results are

very good and very encouraging, to make any final recommendation or assessment relating to BOA's safety record (e.g., certifiable to work without enclosures). A meeting of all the Team members was held on July 19, 1999, to discuss the status and future action. It was decided to bring the system back to Pittsburgh, repair the system, and operate at Pittsburgh using asbestos-containing pipes to collect the data as required by NIBS.

Current Reporting Period Activities: CMU has submitted a proposal to rectify the system for proper use in the future. The main activities to be accomplished are to bring the BOA system back into working condition and to focus on the rebuilding of BOA and testing with stimulant material. After this, testing in an enclosure with wrap-and-cut sections of insulated piping system with real asbestos at an off-site contractor facility will occur. The rebuilding of BOA will include mechanical parts and some other failed components in the clamper and in the removal system and rewiring of the control-computer enclosure. Currently funding is not available to complete the effort. Additional funding to support the effort is being sought.

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Robotics Crosscutting Program

Objective and Scope: The Robotics Crosscutting Program (RBx) supports the D&D Focus Area (DDFA) through technology development, close interaction with D&D Industry and University Programs funded through the National Energy Technology Laboratory (NETL), and introducti on of new robotics technology into DDFA's Large-Scale Demonstration and Deployment Projects (LSDDP). Overall emphasis of the program continues to be design and integration of remote systems and capabilities used for facility deactivation and ongoing surveillance and maintenance activities with extended application to final facility D&D tasks. Deployment of remote D&D systems will reduce worker exposure to hazardous environments and provide productivity increases leading to substantial cost savings.

Status and Accomplishments: FY 1999 activities for the RBx in support of DDFA were focused on providing technical expertise to complete system enhancements and deployment of remote characterization systems in the Hanford 221-U facility ventilation tunnel as part of the Hanford Canyon Disposition Initiative (CDI). Though RBx personnel will continue to provide technical support for remote/robotic applications at the U-plant, the major FY 2000 program focus will be on three initiatives started in FY 1999.

The first initiative, in support of the INEEL D&D program, will develop a low-cost D&D system that integrates the compact remote operator console with the BROKK demolition system or other commercially available mobility and manipulation systems to provide remote viewing and tool control capabilities.

The second new RBx initiative is the development of telerobotic control of remote systems. Telerobotic control provides computer control of system operations, reducing the workload of the operator and increasing system effectiveness through more efficient execution of many tasks. The primary candidate for heavy manipulation in D&D is the Schilling Titan class hydraulic manipulator. DOE expertise in hydraulic control and robotic control systems provides an opportunity to enhance the control for the Schilling manipulators to allow telerobotic operation of these systems.

The final RBx initiative started in FY 1999 is the development of telerobotic systems for D&D of below-grade structures and equipment. There are many below-grade equipment enclosures (pits) with overhead access. Examples of such equipment pits are the filter

pits at Idaho and the much more numerous riser pits associated with the underground storage tanks at Hanford. The process cells within the canyon facilities are further examples of this type of environment. Most of these facilities have radiation or contamination levels that require remote operation for any characterization or D&D functions. These facilities represent target application sites for the telerobotic manipulation system based on the Schilling manipulator, the compact remote operator console, and the telerobotic control capability. Under this task, PNNL will coordinate with the Tanks Focus Area and the RBx Tank Waste Retrieval (TWR) product line in the design and development of a remote equipment pit operations system. The goal of this activity is to incorporate the RBx D&D-developed compact remote operator console and telerobotic control capabilities into the design of the remote equipment pit operations system. The initial target application for the overall system is Project W-314 at Hanford.

Current Reporting Period Activities: The compact console was shipped from ORNL to INEEL during the week of November 22. RBx staff integrated the Brokk control hardware with the compact console and vehicle camera and video system. The integrated compact console/Brokk Low-Cost D&D System was verified with testing in the high-bay laboratory at INEEL during the week of December 13. The compact remote console still requires some cabling clean up using parts that are on order; however, everything is functional in preparation for the January deployment at INEEL to assist in reactor vessel dismantlement at Building TRA-660.

The Schilling Titan II has been installed in the hydraulics laboratory at ORNL. Telerobotic control equipment was moved into the laboratory in mid-November to prepare for initial testing of the personal computer Schilling controller and the QNX Schilling minimaster code on the Titan II. Debugging is continuing.

The hydraulic manipulator laboratory has also installed a Titan 7F that will be used to study plasma torch cutting for the non-RBx DDFA "dual-arm on Rosie" project that will be used to dismantle piping in the old K25 Building 1420. Since there may be issues with the plasma cutting operation that will preclude human presence in the lab during cutting, telerobotics work may need to be suspended during torch testing. Possible ventilation solutions are being considered.

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2.5 Worker Safety and Other Projects

Advanced Worker Protection System

Final Report: Oceaneering Space Systems (OSS) developed a full-scale prototype Advanced Worker Protection System (AWPS), for both Level A (vapor protection) and Level B (liquid-splash protection). The AWPS is a self-contained, extended-service-time breathing and cooling system. The AWPS uses a liquid air backpack to provide air to workers for both breathing and cooling. Breathing air is provided to a pressure-demand respirator worn by the worker. Air is also used to cool water that is circulated in a liquid cooling garment worn against the worker's skin.

The Institute of Environmental Research at Kansas State University completed human-performance tests on an AWPS suit. Firefighters from Manhattan, Kansas were the test subjects. The firefighters walked on a treadmill at 3 mph wearing three different types of apparel: shorts and T-shirt, the AWPS, and standard clothing and self-contained breathing apparatus (SCBA) worn by firefighters. Firefighters were able to walk on the treadmill for 90 min when wearing the AWPS, but only 20 to 30 min when wearing the standard firefighting suit.

OSS demonstrated the AWPS liquid-air cooling system at the International Union of Operating Engineers (IUOE) Innovative Technology and Emergency Response Demonstration at the IUOE Joint Apprentice Training Center in Las Vegas, NV. In a dramatic demonstration, a subject dressed in an AWPS and another in a conventional protective garment and breathing apparatus were given some simple physical tasks to perform. The subject in the conventional gear became intolerably hot within about 30 minutes. The subject in the AWPS remained in the gear and breathing apparatus for almost 2 hours and 30 minutes, and emerged without any reported discomfort from the gear or the work.

A heavy equipment operator tests the AWPS.

OSS was not able to locate a development and commercialization partner to assisting in completing and certifying the backpack design as originally envisioned. Further development was discontinued. OSS has completed the draft final report, which documents the current design and the project's history.

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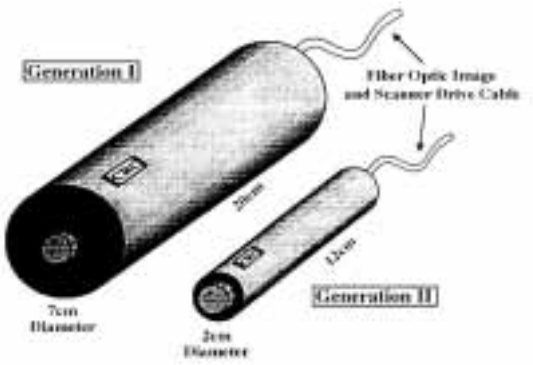
Coherent Laser Vision System

Final Report: Coleman Research Corporation (CRC) has completed the development of the prototype Coherent Laser Vision System (CLVS) with a no-moving-parts scanner and a baseline frame size of 128 X 128 pixels. The CLVS is a lightweight, compact, robust sensor that can provide timely, accurate, and reliable three-dimensional position and orientation data in a dynamic environment. The CLVS consists of an optical receiver, scanner, digital receiver, and video monitor. The CLVS is a fiber-optic-coupled FMCW coherent laser radar. The radar uses the relatively large tuning range of injector laser diodes to achieve greater precision than available with other techniques. An eye-safe laser source is used. An acousto-optic (AO) scanner is used to steer the laser beam and enable addressability of all pixels. A smart digital receiver, that retains knowledge of which pixels have recently changed, permits an



Advancing from the first-generation prototype, Coleman Research is developing a smaller but higher-resolution sensor.

efficient processing scheme by avoiding broad-range searches and concentrating the effort on the dynamic portions of the scene. The fiber optic architecture of the system offers an extremely robust, compact design.

Phase II, the final portion of the development effort, was focused on improving system performance: image quality, image size, and depth of range. However, several months after the Phase II award, the University of Colorado, who was to improve the scanner, decided to pull out. CRC explored without success several alternate approaches including other potential sources. CRC then undertook the effort that was to be provided by the University of Colorado. However, the unexpected technical issues that were encountered in the extensive evaluation of the Bragg Cells and associated mechanical mounting design and the electronic interface board design increased the cost and schedule for the development effort and the project was discontinued.

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Protective Clothing Based on Permselective Membrane and Carbon Adsorption

Objective and Scope: Membrane Technology and Research, Inc. (MTR) is developing and demonstrating improved protective clothing that provides protection equivalent to current garments, but is lighter weight to improve comfort and is breathable to allow water vapor to escape, therefore reducing heat stress. Improved protective clothing will be made of an innovative fabric that combines an ultrathin, permselective outer membrane with a sorptive inner layer. The outer membrane is extremely permeable to water vapor escaping from the wearer, but highly impermeable to hazardous compounds. The sorptive inner layer captures any hazardous compounds that may breach the outer membrane. Fabric properties will be optimized and prototype suits will be tested during Phase I. In Phase II, a minimum of 300 suits will be fabricated and used in a variety of extensive, comparative trials in the laboratory and at hazardous and nonhazardous DOE field sites.

Status and Accomplishments: Development of fabric materials and laboratory tests on the fabric have been completed. In laboratory tests, water vapor transmission rates of 600-900 g/m^2/day have been measured through the fabric. This water vapor transmission rate is far superior to butyl rubber suits with a water vapor transmission rate of 0-10 g/m^2/day. Chemical vapor transmission rates have been equal to or lower than the fabrics of commercial suits.

Two rolls of the fabric were laminated by Uretek. One roll of fabric (90 m by 30 in.), MTR1, uses rip-stop nylon as both inner and outer layers, and the second roll (40 m by 30 in.), MTR2, uses the rip-stop nylon on the outside and a flexible, lightweight, nonwoven fabric on the inside. The prototype suits manufactured by Kappler Systems received the following tests by outside laboratories: chemical permeation, physical properties, sweating mannequin, and heat stress modeling. In general, the results are not as good as expected: although the fabrics do combine water permeability (and reduced heat stress) with chemical protection, neither

An innovative fabric combines an ultrathin, permselective outer membrane with a sorptive inner layer.

the chemical permeation resistance nor the reduction in heat stress was as high as hoped. The economic analysis was updated based on this new data. The analysis shows that MTR1 provides the greatest benefits in productivity; however, the benefit does not appear to justify the higher cost of the suit made of this fabric. MTR2 fabric has less productivity benefit and a higher selling price, and so is less attractive than MTR1.

The permselective garment testing by the International Union of Operating Engineers (IUOE) was concluded at the end of July. The garments tested, for personnel comfort and well-being of the worker while performing work, were those assembled by MTR's potential commercialization partner from the permselective fabrics supplied by MTR, Tyvek, and non-breathable garments like Saranex. The garments were all full bodysuits with hoods (for comparison purposes), and contained a more spacious cut in the chest and waist/crotch area than other manufactured garments, and this was very noticeable and appreciated by the test personnel. This also helped the garments to be more durable. Examples of tasks performed include crawling through confined spaces, performing metal grinding, and loading and hauling material in a wheelbarrow. The MTR garments, in general, were as comfortable, with respect to heat-stress, as the Tyvek garments, and extremely so, over the non-breathable garments. The test personnel all had very good comments concerning the MTR garments.

Current Reporting Period Activities: IUOE is preparing the report documenting results of the garments tests.

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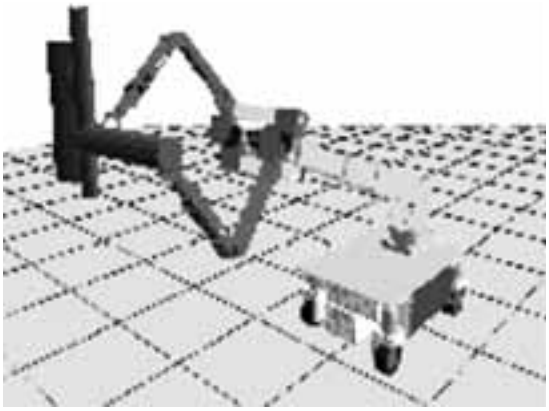
▼ Robot Task Space Analyzer (RTSA)



The Robot Task Space Analyzer will characterize the geometry of tasks for robots.

Objective and Scope: The objective of this project is to develop, integrate, and test a sensor and software system called the Robot Task Space Analyzer (RTSA), a tool that gives robot work system operators the ability to characterize the geometry of tasks to be performed. This geometrical data is necessary to allow selected robot tasks to be automated. The work will be accomplished by developing a combination of software, sensors and computing hardware that enhance the performance of robotic equipment used in typical environmental remediation and waste management projects.

RTSA is an enabling technology necessary for the deployment of telerobotic automation in D&D. It is conservatively estimated that effective telerobotics systems can increase the productivity of D&D remote operations by 10 to 30 percent. If only 10 percent of the projected D&D projects involve remote operations, telerobotic savings enabled through the RTSA could be in the range from tens-of-millions to hundreds-of-millions of dollars.

The RTSA combines laser and stereo imaging, human-interactive modeling, and semi-automatic object recognition to build a 3-D model of the work zone in which a robot system is operating. In future telerobotic worksystems, RTSA results will be accessed by automatic collision checking and motion planning routines to automate subtask execution.

Status and Accomplishments: The Phase I draft Topical Report has been received. The preliminary results of this work show that the benefit of the Human

Interactive Stereo and Semi-Autonomous scene analyses can be practically combined. The goals of the first phase are accomplished. A comprehensive design that has emphasized human interaction and human factors engineering principles has been completed. RTSA is a human interactive system that allows a remote operator to direct the construction of 3-D geometrical descriptions of the task objects (e.g., pipes, valves, tanks, etc.).

A laboratory test demonstration was performed in September 1999. The key objective in the development of the RTSA was to use the earlier work in task space scene analysis as a foundation for the development of an in situ geometrical modeling system. This system is a practical tool that typical remote equipment operators could use comfortably. The test results show that the current RTSA design achieves this important goal. Initial time results indicated that RTSA has the ability to construct models of a task space scene analysis layer on the order of minutes. Future work will involve the implementation and detailed evaluation of a complete RTSA system. All of the program will be executed on PC workstations with NT operating systems. Tests will be performed on several task mockups with multiple subjects and trials at the Remote Technology Assessment Facility at the Oak Ridge national Laboratory. In addition, the RTSA system will be integrated with the Dual Arm Work Platform to achieve a comprehensive and working telerobotic system.

Current Reporting Period Activities: Improvements to the model builder in RTSA are continuously being made to speed the model building process. A utility was added that allows the user to point and click in a live camera image to reposition the pan-tilt head to point the laser range finder at a desired physical point. A split screen view was added to the Envision modeling window. These multiple views allow the operator to make slight adjustments more easily and accurately. Integration of the autoscan procedures is also progressing and the stereo autoscan communication has been completed. Improvements are being made to these procedures so that their usefulness can be adequately evaluated.

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Integrated D&D Decision Analysis Tool

Objective and Scope: The objectives of this work are to develop a computer-based Survey Module, update the existing computer-based Decontamination and Decommissioning Technology Database Module, integrate the Survey Module and the D&D Technology Module, and distribute the integrated software. FedTech, Arrey Industries, NES, and Research Triangle Institute have teamed to accomplish this effort. The existing D&D Technology Database Module being updated under this task was developed under a previous contract with Arrey Industries, NES, NEXI and Research Triangle Institute. The Survey Module will be able to cost effectively assist in preparation and execution of plans for initial facility surveys, operational surveys during D&D work, and final facility release surveys. The Survey Module will estimate the budget, schedule, labor, radiation dose, waste generation, and equipment requirements to perform these surveys along with defining the number and location of survey points and recommended survey instruments. The Survey Module will integrate the collection, storage, and reporting of survey data.

Current Reporting Period Activities: The team continued data quality review and acquisition of new technology data elements for the D&D Technology Module. The coding of the software for the Survey Module continued. Work continued to fill in all requirements (input, operations and output) for each of the steps required to complete a characterization survey plan and report, final survey plan and report, historical site assessment, and execution steps for each.

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Modular Manipulator for Robotic Applications

Objective and Scope: This project focuses on the needs of Automated Plutonium Processing (APP) tasks that involve the manipulation of plutonium containers and the transfer of their contents. Specific challenges of APP gloveboxes include restrictive entry ports, confined workspace, limited maintenance access and destructive plutonium particulates, which make this task virtually impossible to automate with existing technology.

In order for automation systems to be successful within DOE facilities, they must provide maximum functionality, flexibility, ease of use, and reliability, while facilitating the rapid deployment of each custom system. This work concentrates on in-depth design and deployment of self-contained actuator modules, which will be used to construct a robotic manipulator tailored for APP tasks. A human-scale manipulator will be built from two sizes of DISC Actuator and will replace existing human labor within plutonium gloveboxes. The modular nature of ARM Automation's technology readily enables installation and maintenance of automation within "hot" boxes.

Status and Accomplishments: A survey of the state-of-the-art modular manipulator's design is completed. This survey addresses modular manipulators developed inside government laboratories, universities, and private industry for such applications as space exploration or control research and commercially viable industrial applications. Based on this study, it is possible to define the requirements of one manipulator system that can be used to conduct automated transfer operations within plutonium gloveboxes and some D&D applications.

Current Reporting Period Activities: Development of the test plan for testing the manipulator configuration was started. This effort included determining the best manipulator configuration to fit in a glovebox. A solid model of glovebox was obtained from Sandia National Laboratory to aid in this effort. A path was then planned for the testing of the manipulator. Discussion is being held with the end users, and their requirements are being integrated in the final product. The Project Manager of Arm Automation visited the Idaho National Engineering and Environmental Laboratory to discuss the potential requirements of the modular manipulator at the site.

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3.0 Programmatic Structure and Organization

Within the Environmental Management (EM) organization, the Office of Science and Technology (EM-50), formerly the Office of Technology Development, has the overall responsibility to develop and demonstrate technologies and systems to meet DOE's needs for environmental restoration and waste management. The office works closely with the EM Offices of Waste Management (EM-30), Environmental Restoration (EM-40), and Nuclear Materials and Facilities Stabilization (EM-60) in identifying, developing, demonstrating,and deploying innovative, cost-effective technologies and systems. Activities within EM-50 include research, development, demonstration, testing, and evaluation (RDDT&E); technology integration; technology transfer; and program support.

Program Structure

To focus DOE efforts on the most urgent needs, EM-50 has established four focus areas that address DOE's most pressing problems:

- Deactivation and Decommissioning (D&D)
- High-Level Waste Tank Remediation
- Mixed Waste Characterization, Treatment, and Disposal
- Subsurface Contaminants Containment and Remediation

In addition, EM-50 has established three crosscutting technology areas that conduct efforts where technology needs and targets are relevant to more than one focus area. The crosscutting areas are:

- Characterization, Monitoring and Sensor Technology (CMST)
- Efficient Separations and Processing (ESP)
- Robotics

"It's time we elevate the profile and prestige of this world-class facility, which has been helping solve energy and environmental problems for more than 50 years,"

Bill Richardson, U.S. Secretary of Energy, National Energy Technology Laboratory Dedication Ceremony

The Industry Program conducts competitively selected activities that involve the private sector in developing, demonstrating, and implementing improved technologies that address the needs of the focus areas and the crosscutting areas.

The result of this structure of programs is that the D&D Focus Area is positioned to support those research areas defined as highest priority by EM-50 and DOE customers.

The Role of NETL

The Federal Energy Technology Center, with physical sites in both Pittsburgh, Pennsylvania and Morgantown, West Virginia, was redesignated by U.S. Secretary of Energy Bill Richardson, as the National Energy Technology Laboratory (NETL). As the 15th national laboratory, NETL becomes part of the national laboratory research system. This is the largest research system of its kind in the world with more than 30,000 engineers and scientists conducting research and research and leading-edge experiments. As part of this system, the new National Energy Technology Laboratory will join Argonne National Laboratory (Illinois); Brookhaven National Laboratory (New York); Lawrence Berkeley National Laboratory (California); Fermi National Accelerator Laboratory (Illinois); Idaho National Engineering & Environmental Laboratory (Idaho); Lawrence Livermore National Laboratory (California); Los Alamos National Laboratory (New Mexico); National Renewable Energy Laboratory (Colorado); Oak Ridge National Laboratory (Tennessee); Pacific Northwest National Laboratory (Washington); and Sandia National Laboratories (New Mexico and California).

Rita A. Bajura, NETL Director, a career federal executive with more than 18 years experience in government-industry energy partnerships, continues in her leadership position as head of the single management team that serves both physical sites with a combined working force of more than 530 federal scientists, engineers, and administrative staff. NETL is responsible for nearly 600 research projects; most involving the development of advanced fossil fuel technologies.

In addition to the new national laboratory's core capabilities, Secretary Richardson announced that a newly created Center for Advanced Natural Gas Studies, would be an integral part of NETL's research endowment.

Senator Robert C. Byrd, (WV) remarked in the course of the dedication that, "Much of the laboratory's work is dedicated to the worthy goal of developing innovative, clean and efficient technologies that will allow our nation to meet its growing energy needs. As the nation's newest national laboratory, it will continue to help light a pathway for a new era of energy use that will ensure a comfortable standard of living for our children and our children's children."

NETL also manages a significant portion of the technology development needed to clean up sites in the government's nuclear weapons complex. In February 1995, the then Morgantown Energy Technology Center was selected by EM-50 to be the implementing organization for the D&D Focus Area. As such, it brought the experience gained from being the implementing organization for the Industry Program, which competitively selects industrial R&D performers through Research Opportunity Announcements (ROAs) and Program Research and Development Announcements (PRDAs). As the lead organization for D&D implementation, NETL is responsible for the planning, monitoring, and evaluating RDDT&E projects to meet the requirements of EM-50 and its customers in EM-30, EM-40, and EM-60.

▼ Stakeholder Feedback

The stakeholders in the D&D Focus Area include DOE headquarters; DOE operations offices; DOE sites and their operating contractors; D&D technology developers and users in the private sector; federal, state, and local regulators; and the communities around affected DOE facilities. These stakeholders have been providing input to focus area planning and implementation; program contacts are provided on the first page of this report.

4.0 BACKGROUND

The D&D Focus Area was established to develop and demonstrate improved technologies and systems that could solve customer-identified needs to characterize, deactivate, survey and maintain, decontaminate, dismantle, and dispose of or recycle DOE surplus facilities and their contents. The mission also includes facilitating the acceptance, approval, transfer, commercialization, deployment, and implementation of these technologies and systems.

These technologies are needed to address the pressing needs of deactivating more than 7000 contaminated buildings and decommissioning more than 700 buildings. In addition, material disposition is required for over 600,000 tons of metal and 23 million cubic meters of concrete in contaminated buildings and for 400,000 tons of metal currently in scrap piles. The major drivers for this focus area are the high safety and health risks associated with working in aged and contaminated facilities and the high costs associated with facility deactivation, sur-veillance, and maintenance using currently available baseline technologies.

D&D Focus Area Strategy

Subsequent to the selection of NETL as the lead organization for the D&D Focus Area, a program review of all FY95 projects was held in May 1995. Based on this and other recent program reviews, as well as the general requirement for fiscal constraint throughout, the following strategies were developed:

Programmatic Strategy

- Focus D&D technology development program on large-scale demonstrations emphasizing full-scale demonstrations using a suite of improved technologies.
- Demonstrate technologies only through large-scale demonstrations.
- Focus on technologies that are identified as high priority by customers, that have wide applicability, and that have a commitment to be considered for use by customers.
- Emphasize demonstration and deployment of private-sector technologies.
- Technical Strategy

In the near term, emphasize technologies to effectively support:

- deactivation of facilities,
- decontamination of surfaces,
- reuse of bulk contaminated materials,and
- application of remotely operated dismantlement systems

In the middle term, emphasize technologies to effectively support:

- applications of remote surveillance systems,
- characterization of volumetrically contaminated materials,
- decontamination of bulk materials, and
- adoption of release standards for bulk contaminated materials.

Large-Scale Demonstrations

A cornerstone of the D&D Focus Area is its series of large-scale demonstration and deployment projects. The LSDDPs demonstrate innovative and improved D&D technologies at full scale, side by side with existing commercial technologies. The intent is to compare benefits from using a suite of improved and innovative D&D technologies against those associated with baseline D&D technologies. This approach provides an opportunity to test improved and innovative D&D technologies at a scale that will provide meaningful cost and performance information to the potential end-users of the technology.

5.0 Upcoming Events

The following conferences and workshops may be of interest to those with a stake in D&D cleanup activities.

March 2000

Deactivation and Decommissioning Focus Area Mid-Year Review

March 28–30, 2000

Morgantown, West Virginia

(304) 285-4715

June 2000

IDS 2000—International Decommissioning Symposium

www.ids2000.org

U.S. Department of Energy

Knoxville, Tennessee

June 12–16, 2000

September 2000

Spectrum 2000

Chattanooga, Tennessee

September 24–28, 2000